# Orthodontics

MDDr. David Hrňa

david.hrna@fnusa.cz

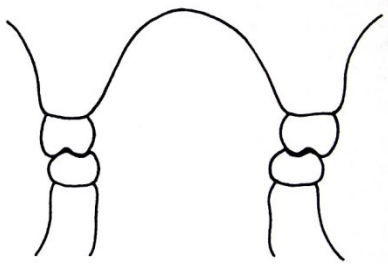
# ORTHODONTICS

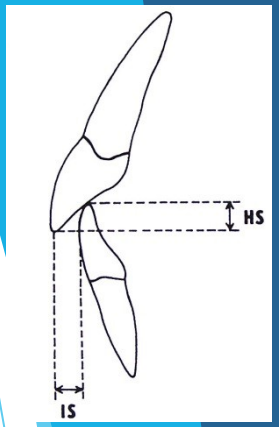
Stomatological specialisation dealing with prevention, diagnostics and therapy of irregular tooth position, relationship of dental arches and jawbones

# GOALS OF TREATMENT:

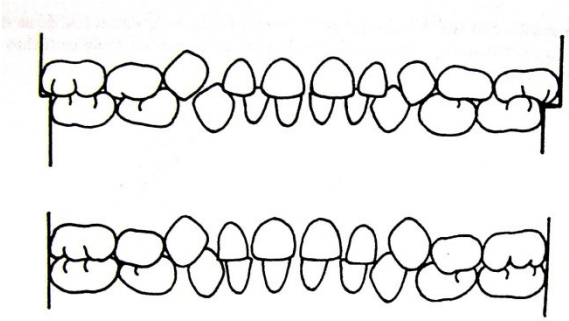
- Ideal functional occlusion
- Ideal soft tissue proportions and adaptation
- Ideal jaw, skeletal and dental relationship

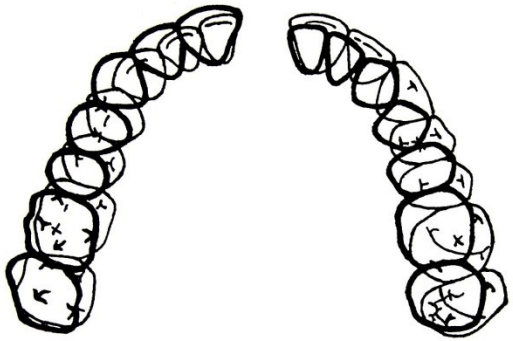
# Ideal occlusion

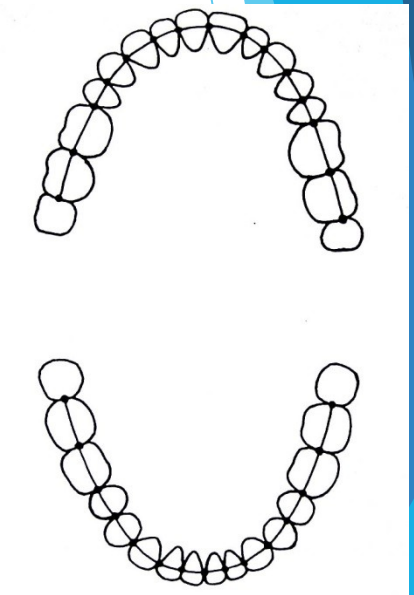





- correct relationship of molars
- correct overjet and overbite
- Correct intercuspidation of teeth
- Points of contact are lined in an regular arch
- Deciduous dentition is ended either by a small step or the posterior teeth surfaces are aligned





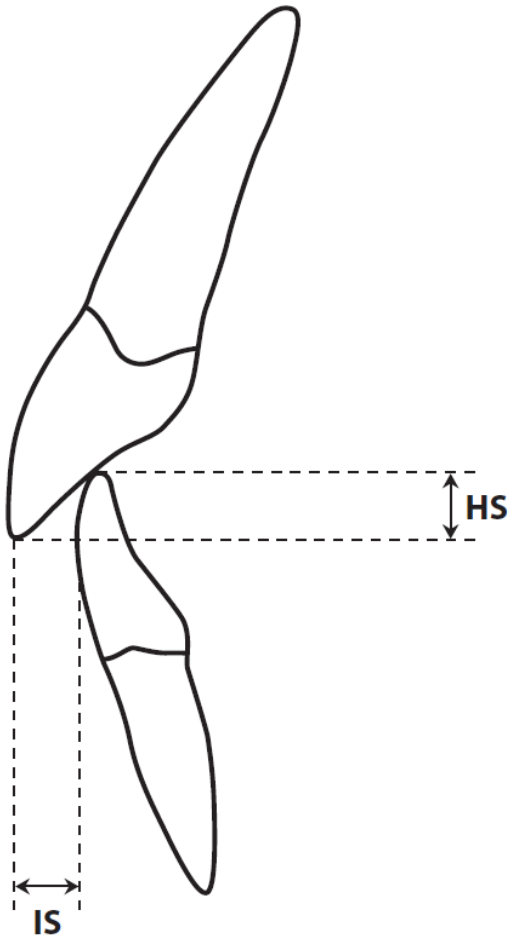


Correct dentition has 6 keys of correct occlusion- Andrews

# Ideal occlusion

# Overjet and overbite

- Upper dental arch covers the lower dental arch in horizontal plane = OVERJET – distance between vestibular plane of lower incisor and incisal edge of the upper incisor
- Upper dental arch covers the lower dental arch in vertical plane = OVERBITE – distane between incial edge of lower incisor and incisal edge of the upper incisor




Overjet = IS, Overbite = HS

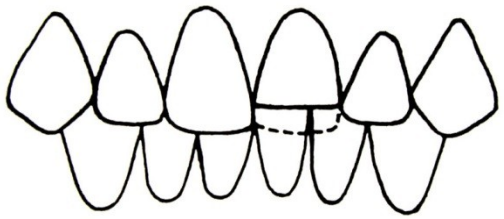
# Classification of orthodontic anomalies

1. Anomalies of single tooth

Inclination – tooth tipping mesially,distally,

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

Vertical anomalies - supraocclusion, infraocclusion

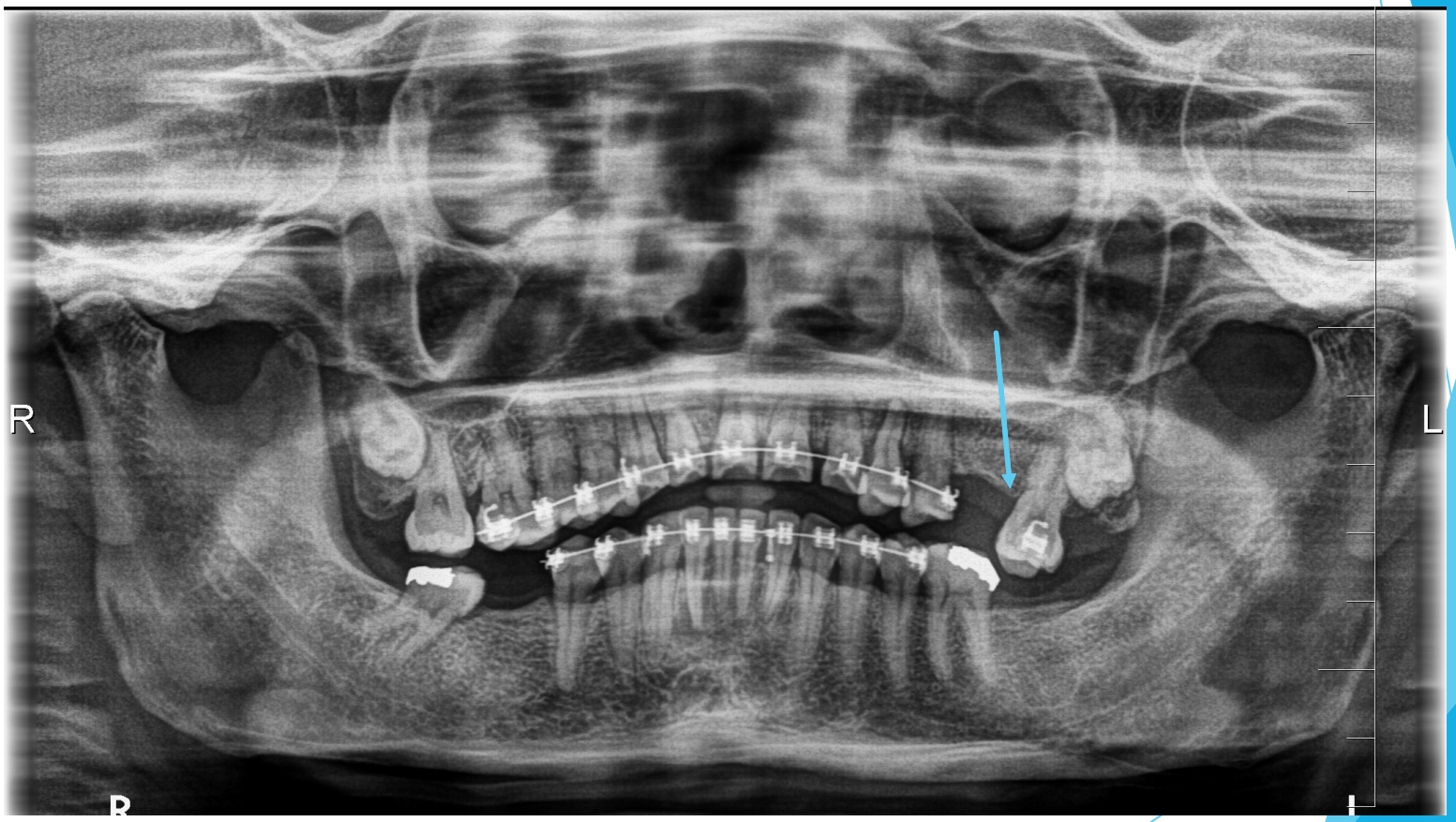


# Protrusion x Retrusion

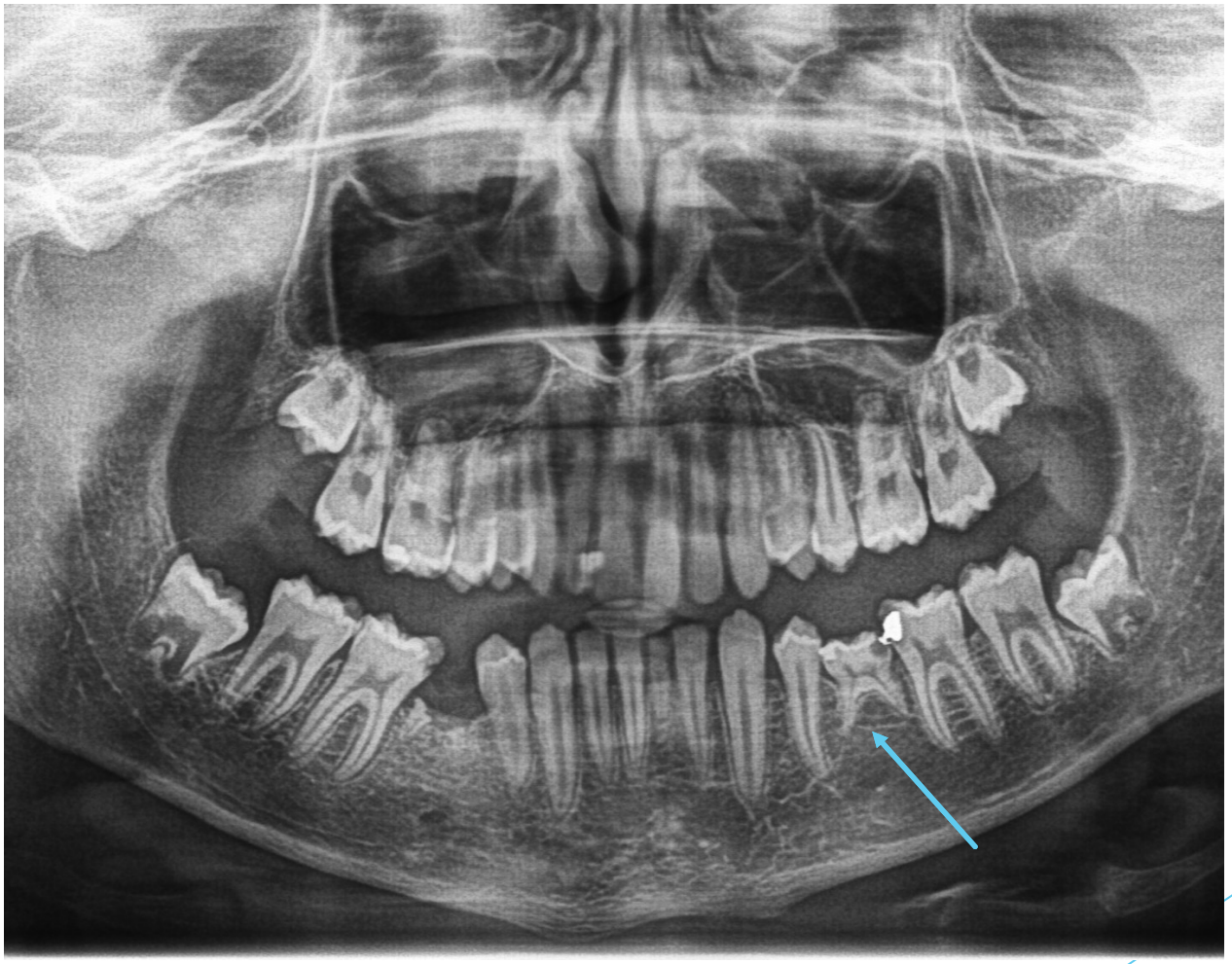
Protrusion

Retrusion

# Supraocclusion



# Infraocclusion



# 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

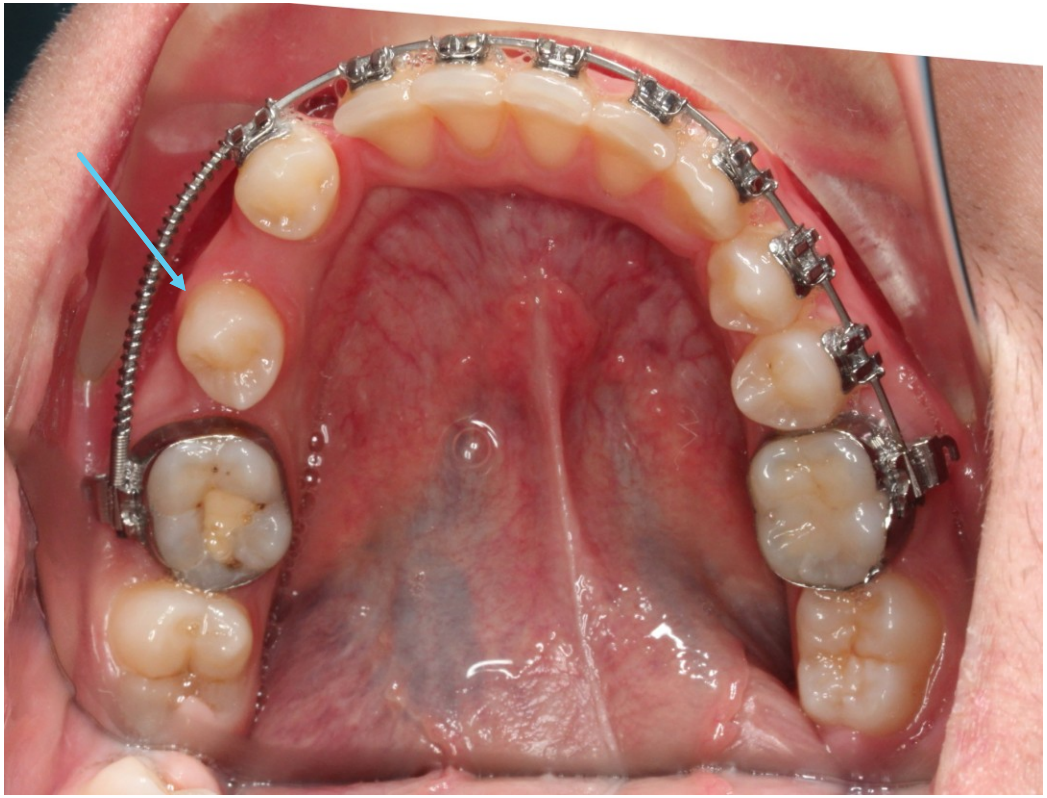
Impacted teeth – the teeth is developed, but not erupted, most often: wisdom teeth, upper canine

Ankylosis, reinclusion

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

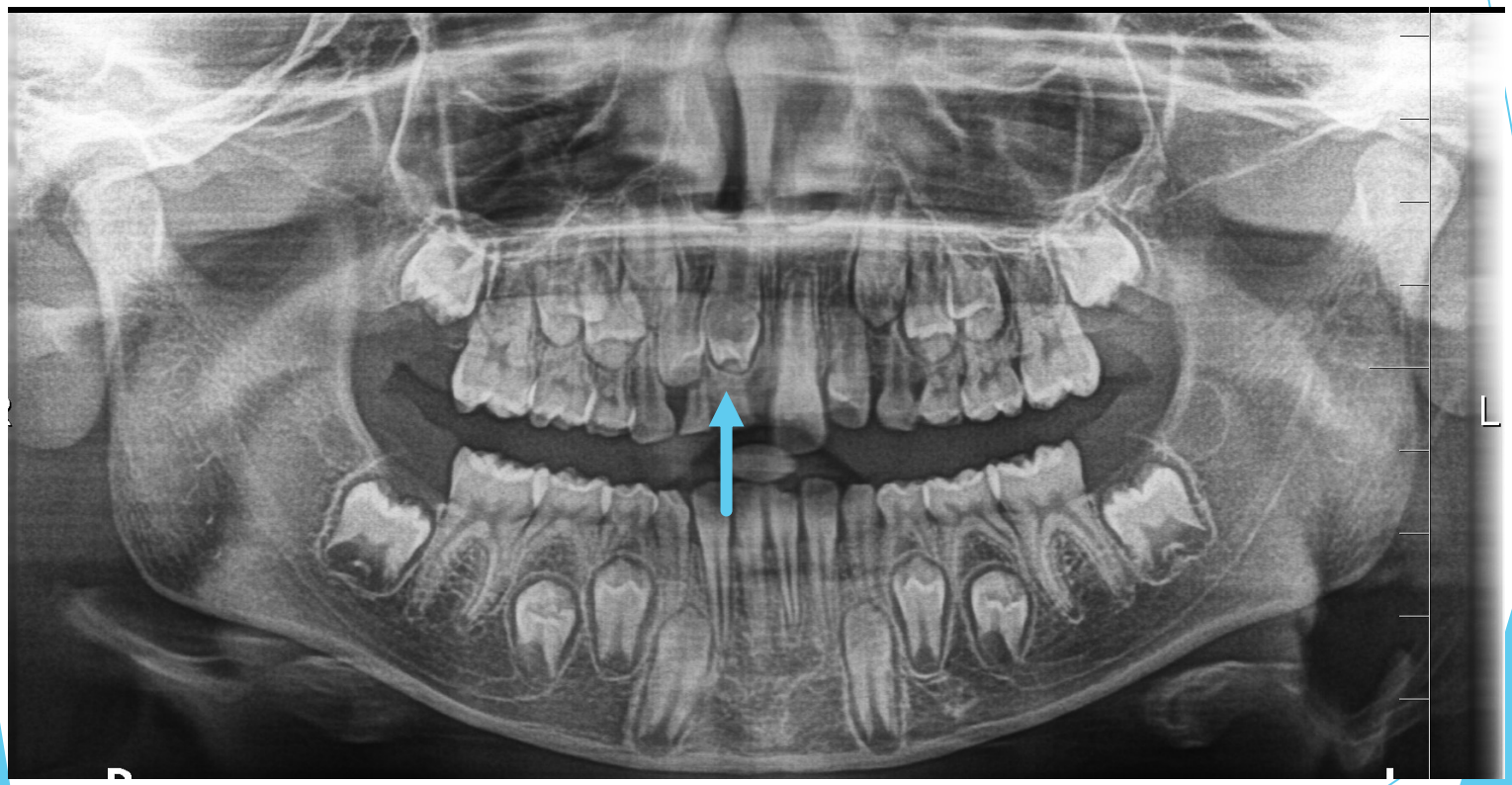
Hypodontia – the correct number of teeth is reduced because some teeth are absent due to agenesis of their germs [most frequently- upper lateral incisors, third permanent molars, premolars]

# Rotation

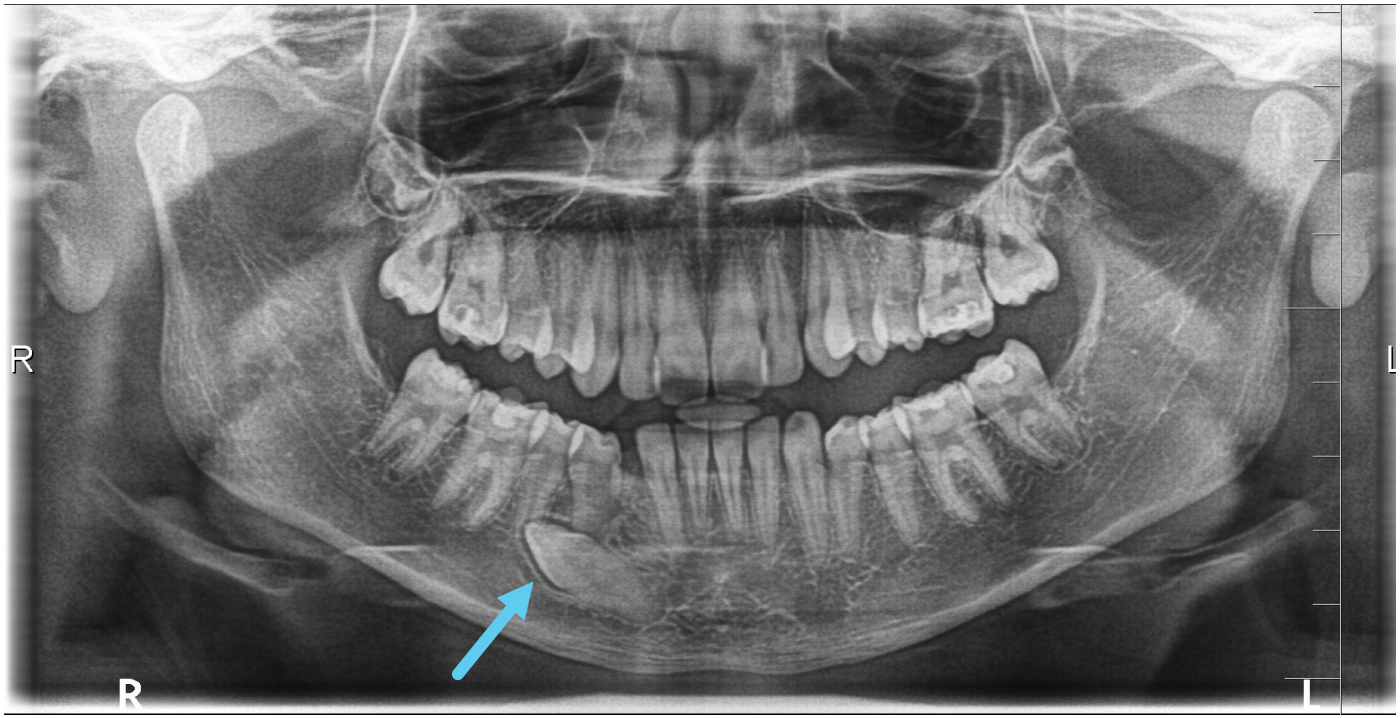


# Hypodontia

# Hyperodontia



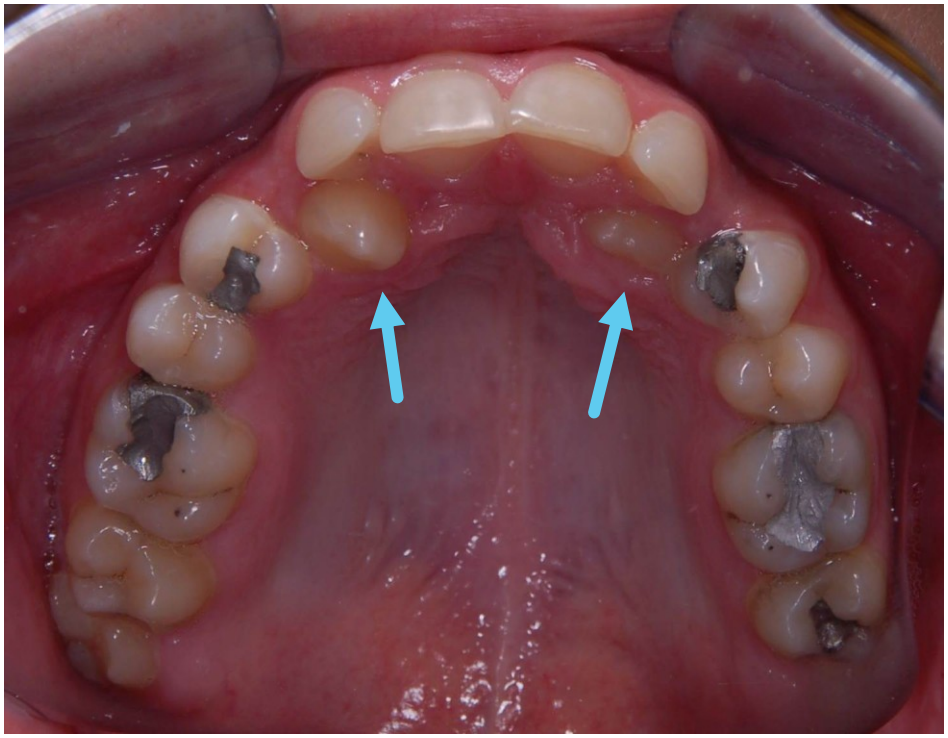
# Impacted tooth



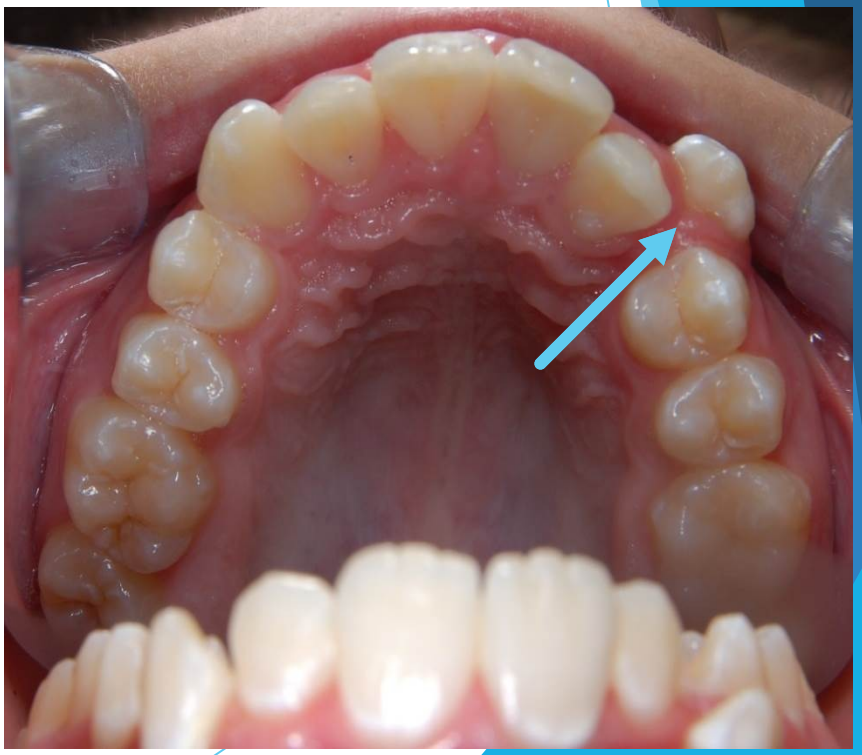
# Palatal eruption

- Palatal eruption of the upper second premolar

# Palatal eruption



# Vestibular eruption



# Anomalies of the shape of teeth

Peg teeth – lateral incisors

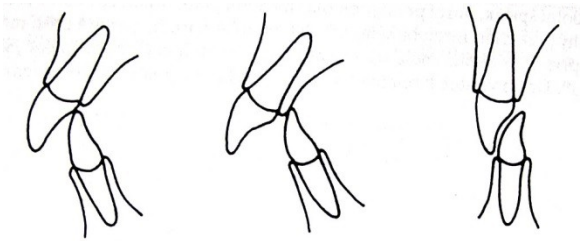
# Classification of orthodontic anomalies

## 2. Anomalies of groups of teeth

- groups of teeth are in irregular position

Protrusion, retrusion

Anterior cross bite– is in the frontal part – lower tooth is more anteriorly than the upper tooth



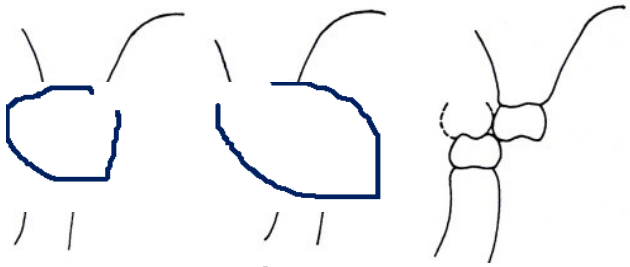
# Protrusion with deep bite

# Inverted bite

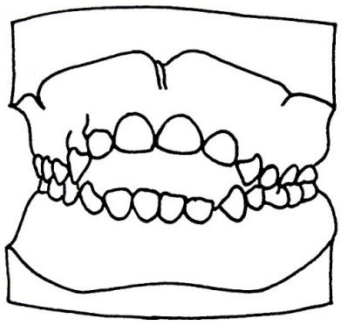
# Classification of orthodontic anomalies

## 2. Anomalies of groups of teeth

Cross bite – in lateral part the buccal cuspids of lower molars are more buccaly than the in 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

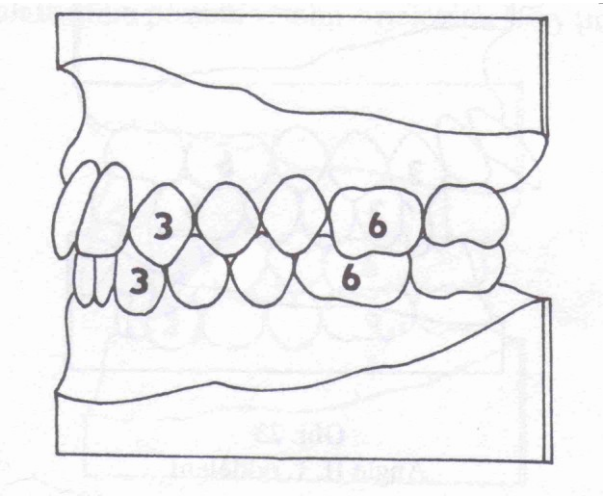
# Deep bite

# Crowding

# Classification of orthodontic anomalies

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

Class I . normoocclusion



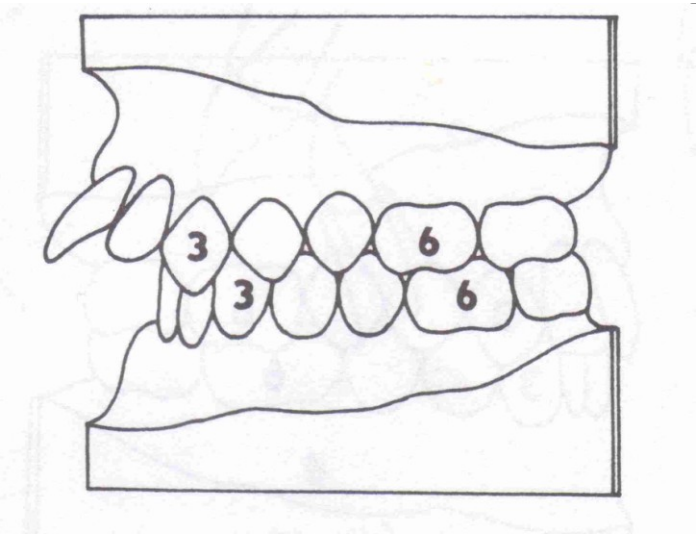

# Angle I

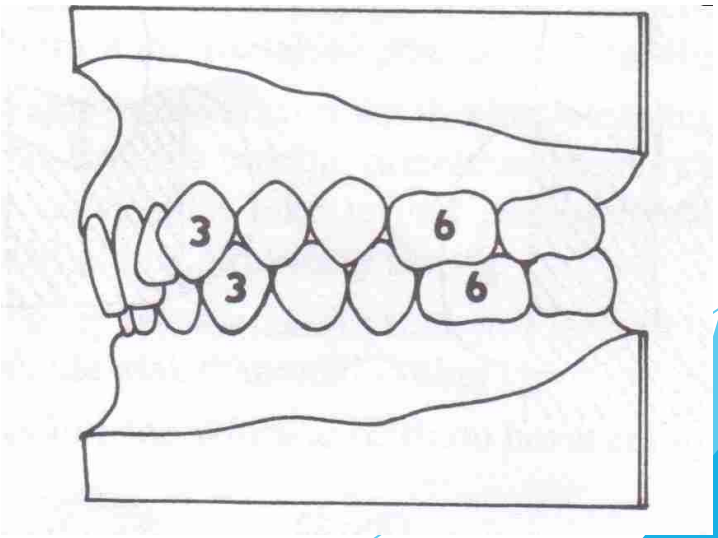
# Classification of orthodontic anomalies

- Class II : distal occlusion

  - with protrusion of upper incisors

  - with retrusion of upper incisors

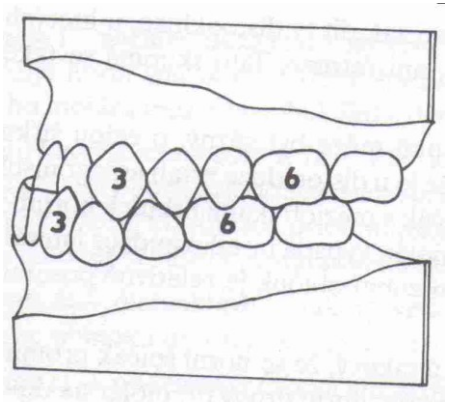


# Angle II

# Classification of orthodontic anomalies

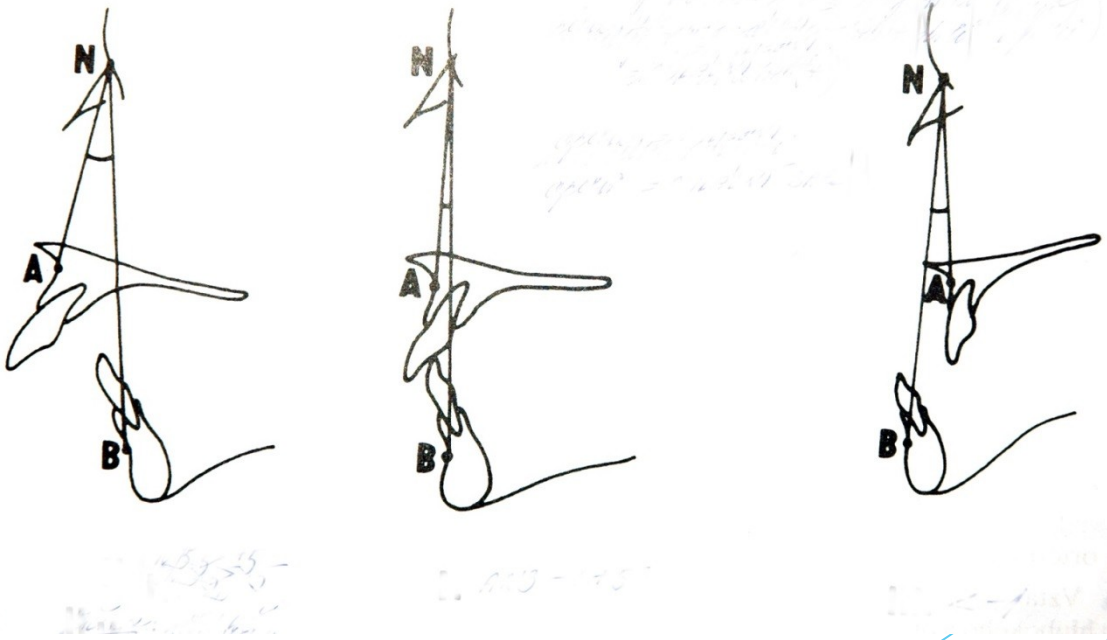
- Class III : mesial occlusion




# Angle III

# Classification of orthodontic anomalies

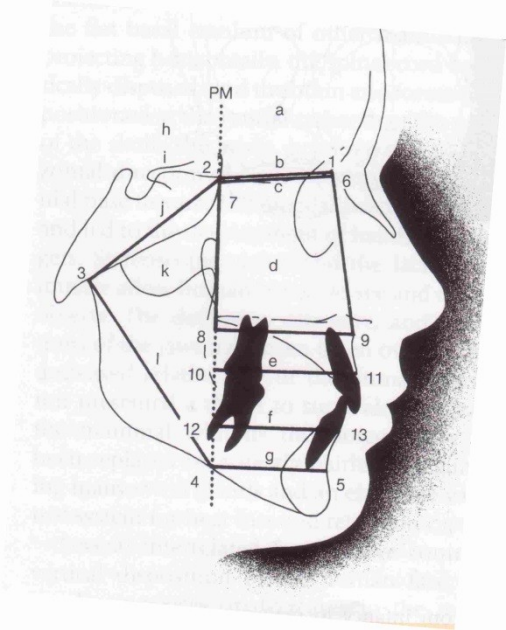
- 4. Anomalies of position, size and relationship of the jaws-bones

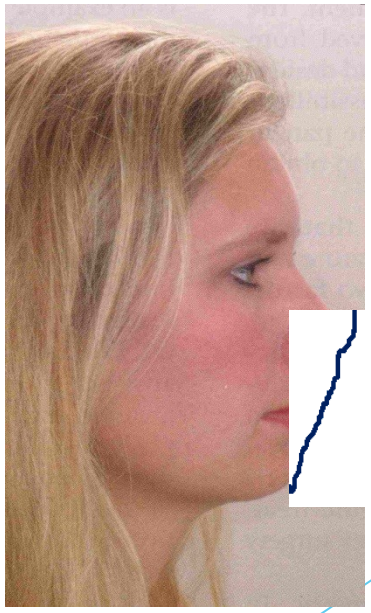


# Classification of orthodontic anomalies

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

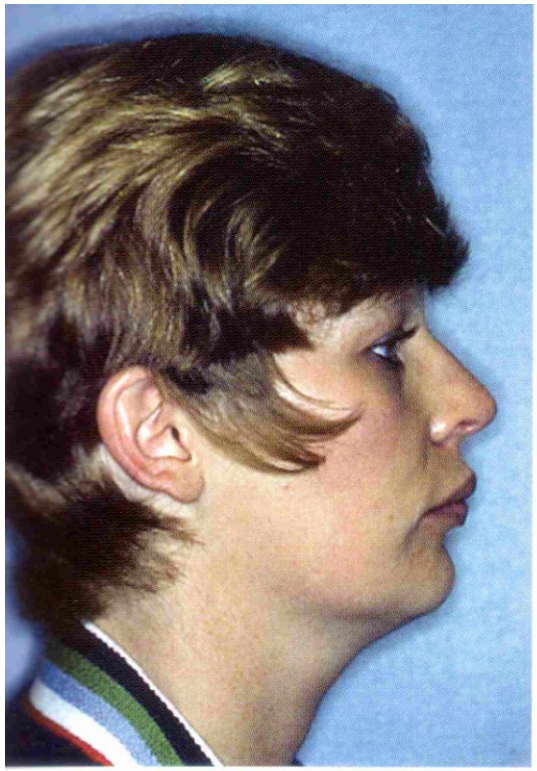
Skeletal class I : relationship of jaws without any deviation

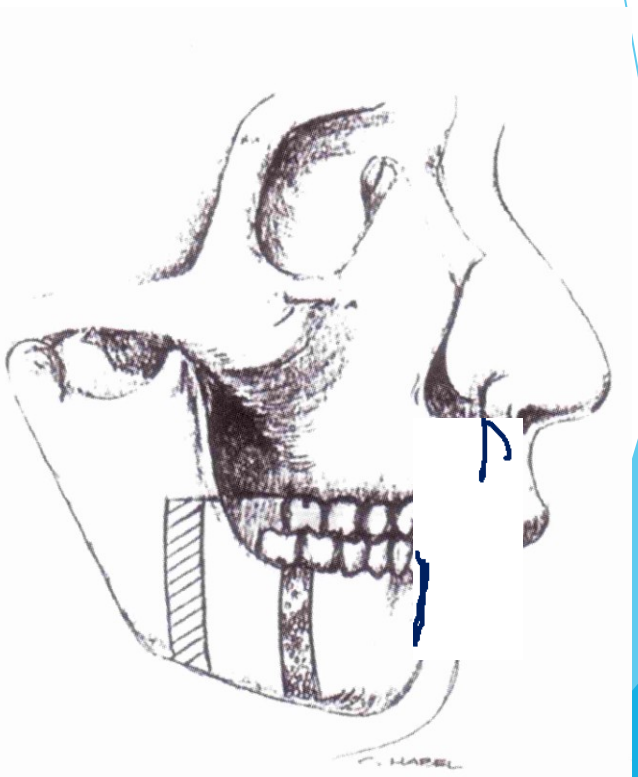


# Classification of orthodontic anomalies

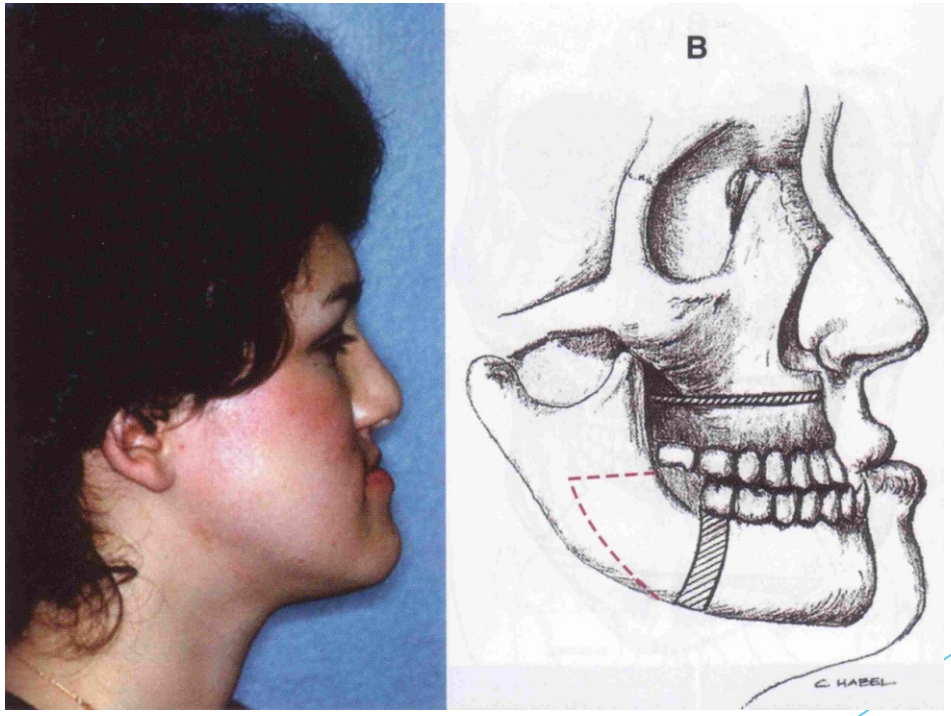
- **Skeletal class II :** the lower jaw is more distally to the upper jaw (small lower jaw, large upper jaw)



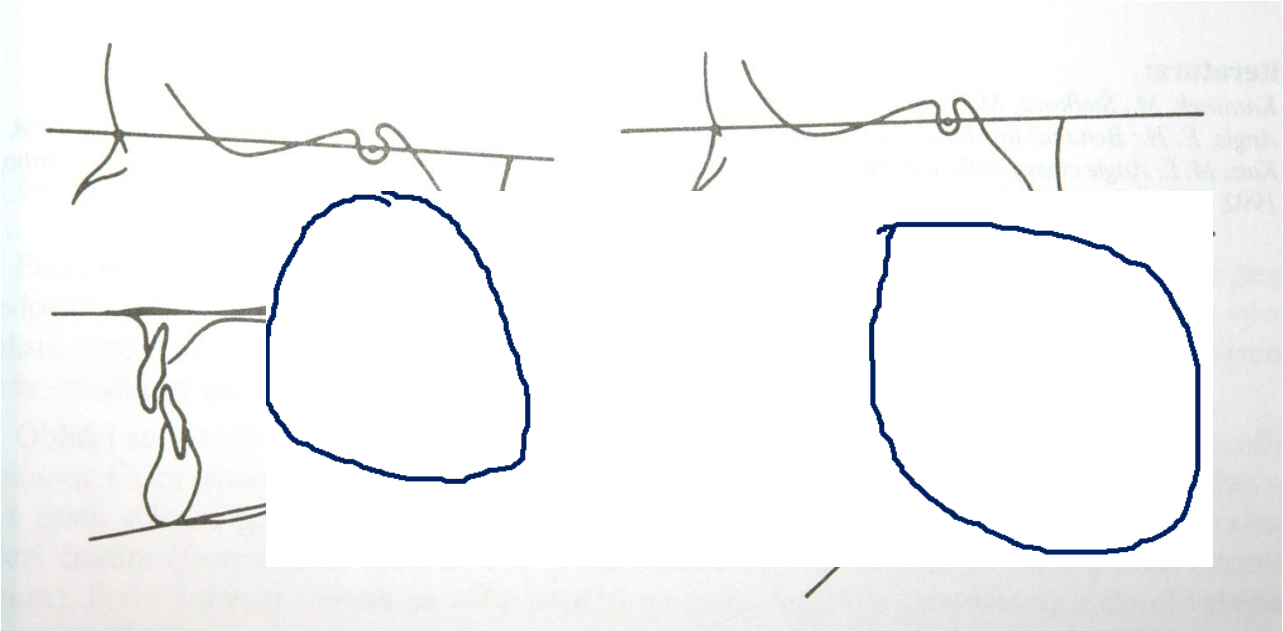


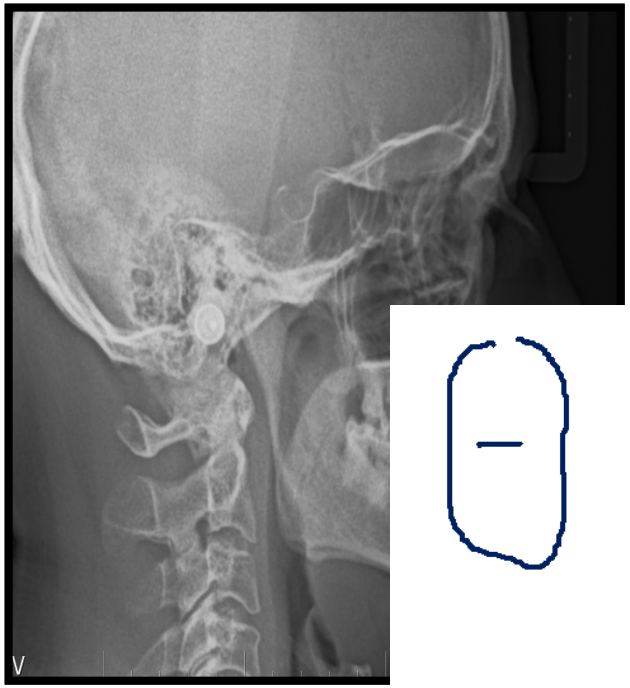
# Classification of orthodontic anomalies

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



# Classification of orthodontic anomalies








# 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
- allergies
- 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

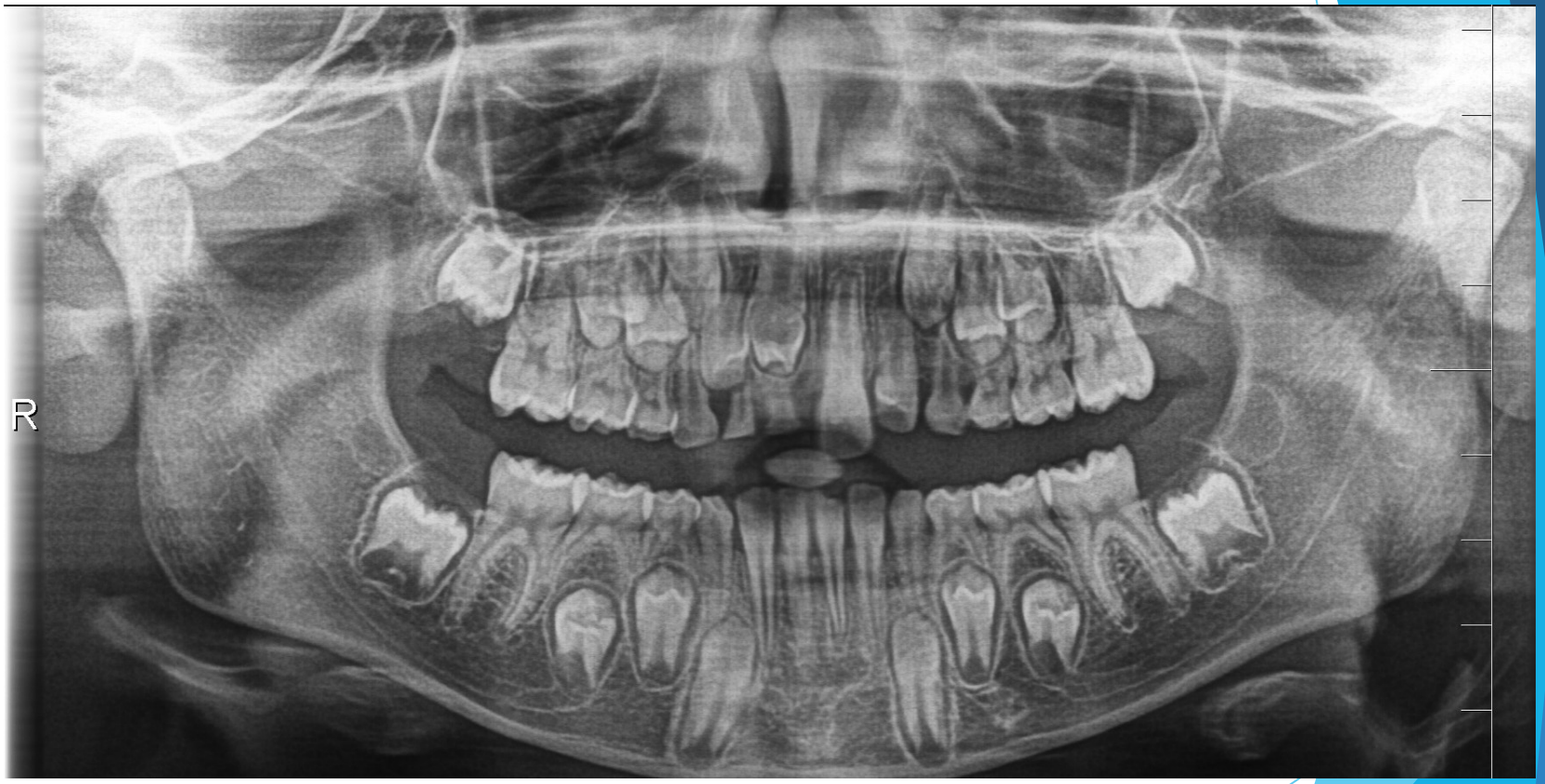
# Diagnostic examination

## 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


R

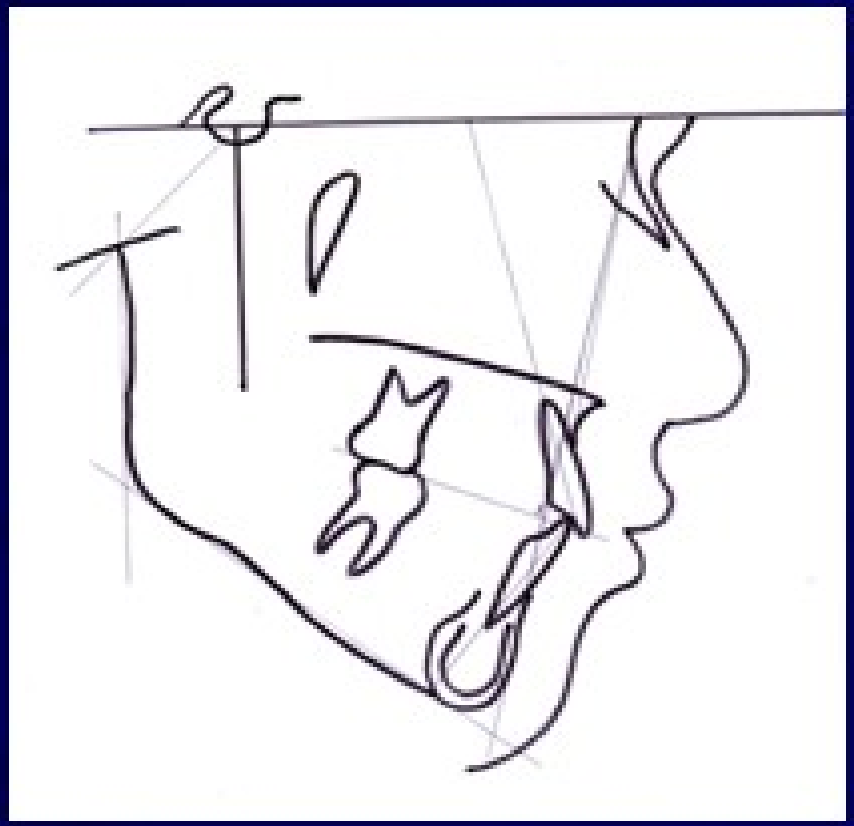

R

# 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



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 (12)

Is – incisale superius (13)

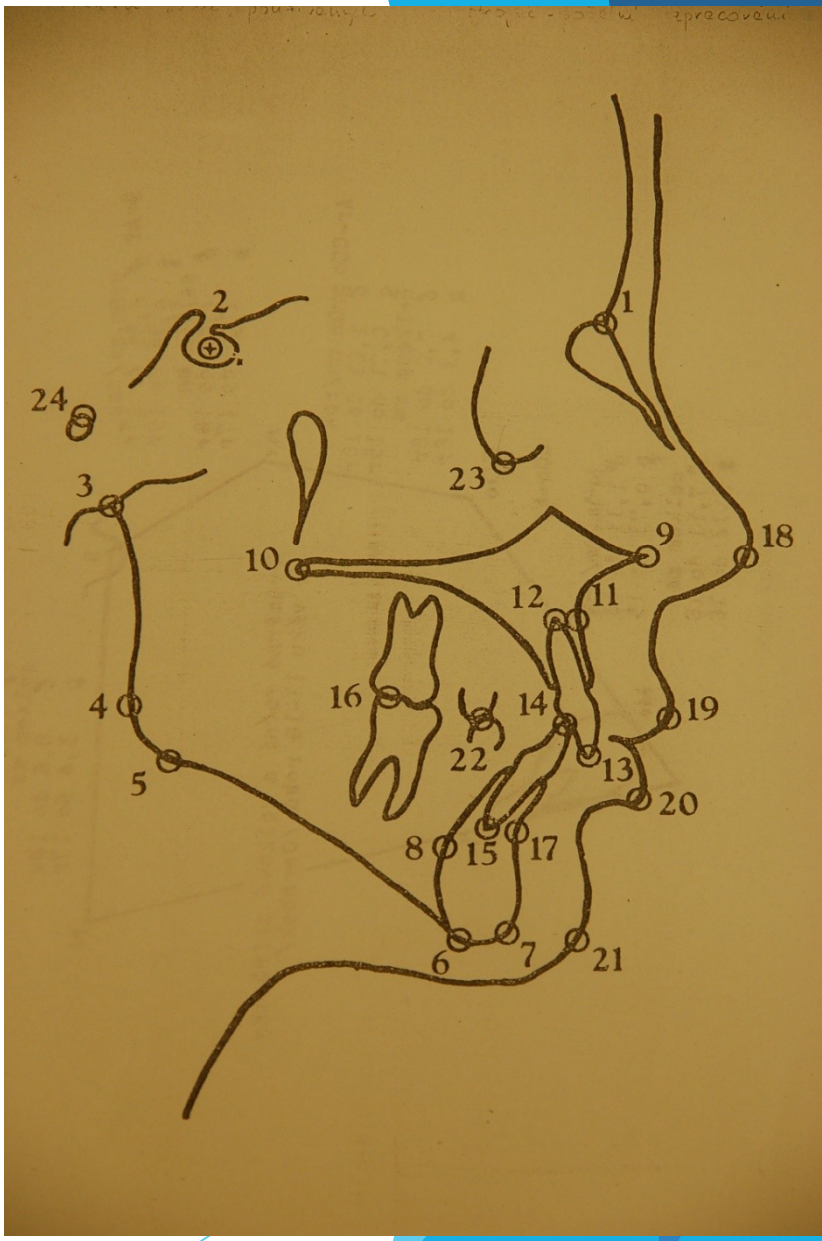
Ii – incisale inferius (14)

Ii´- apex (15)

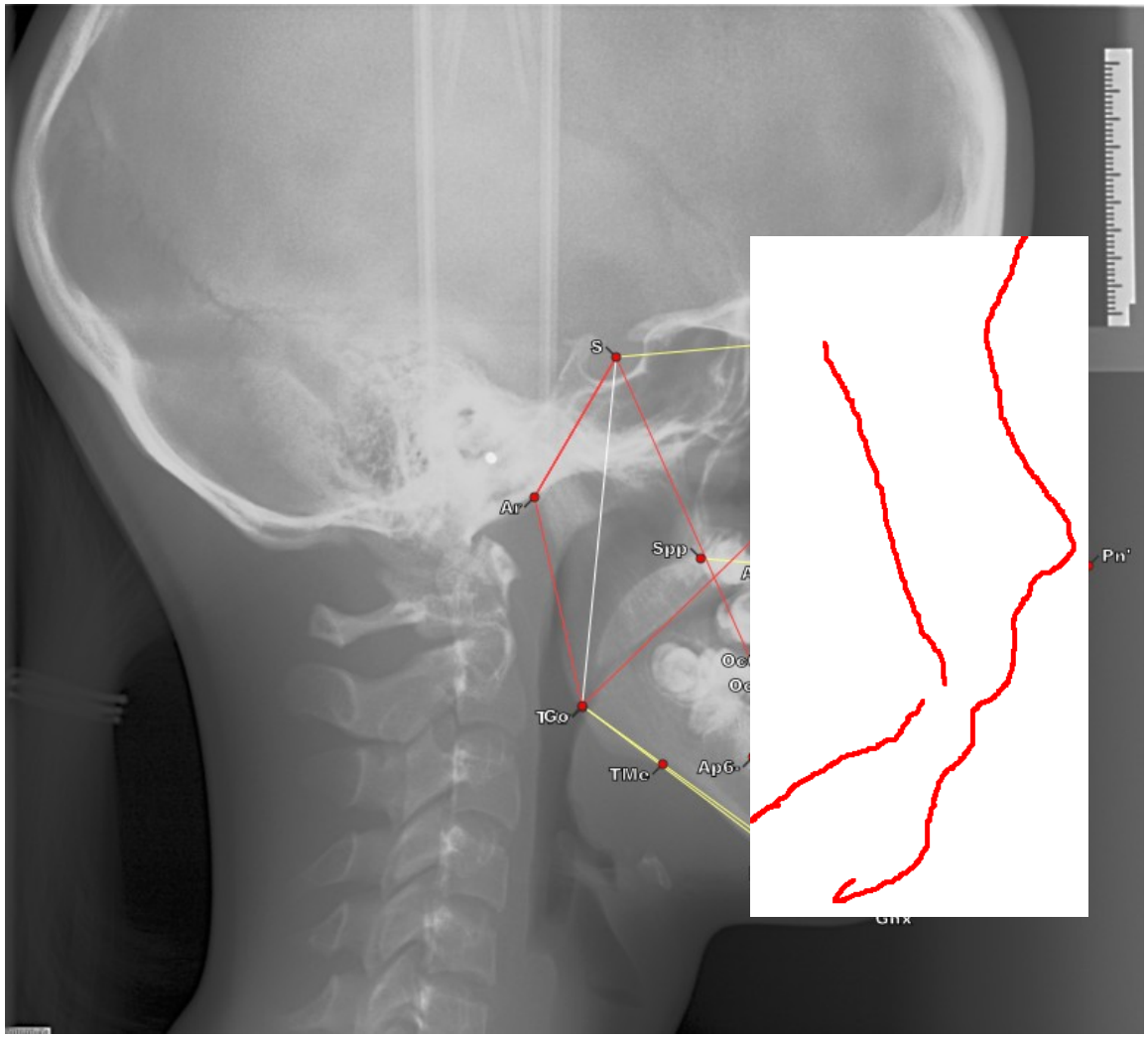
B – bod B (17)

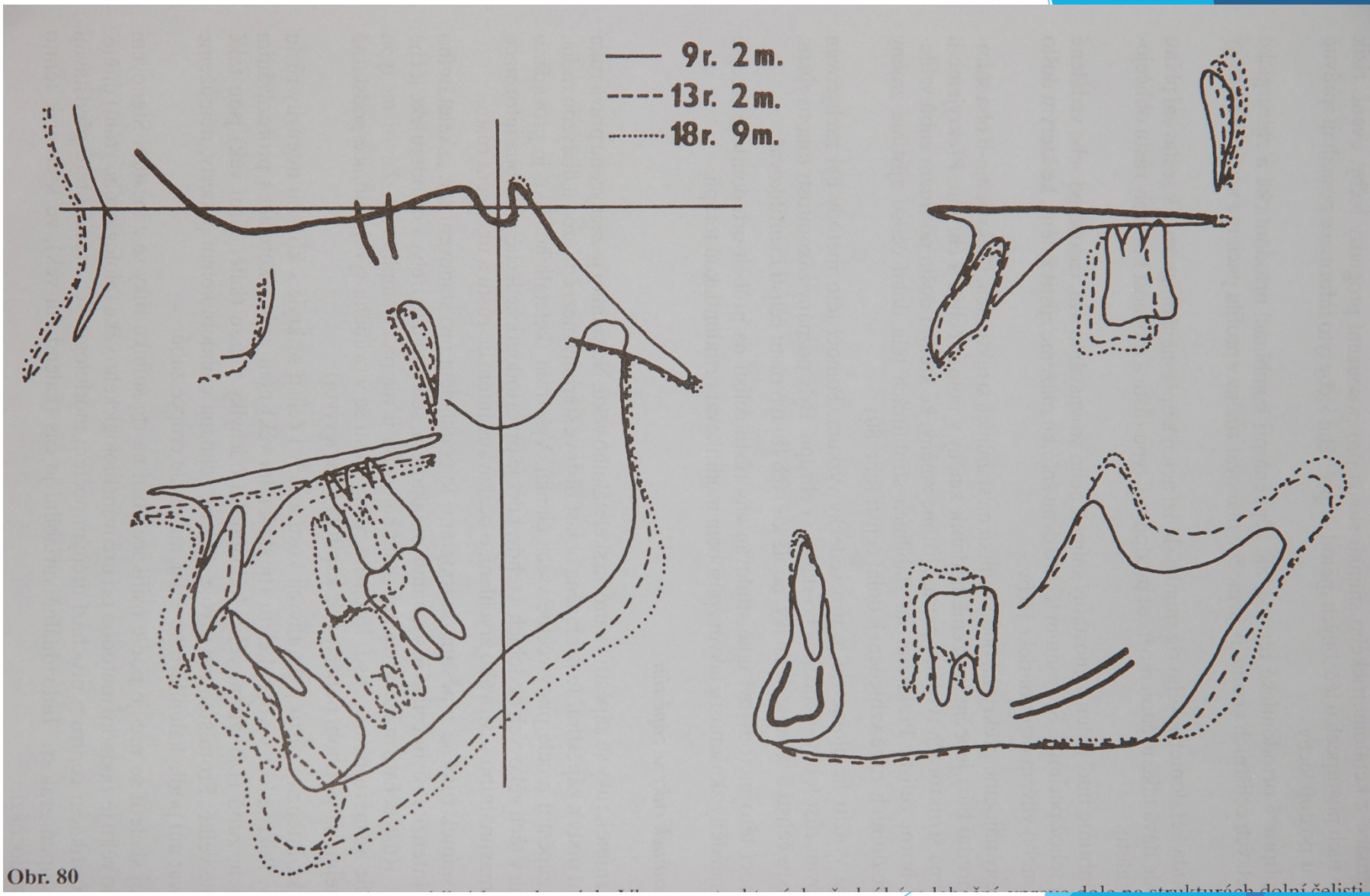
Go – gonion (kontr. bod: 1. a-4, 2. ML)

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

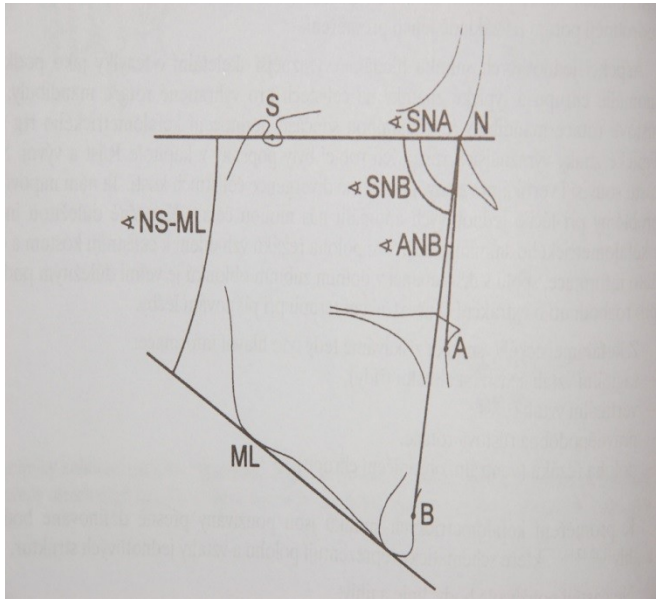


# Cephalometric analysis



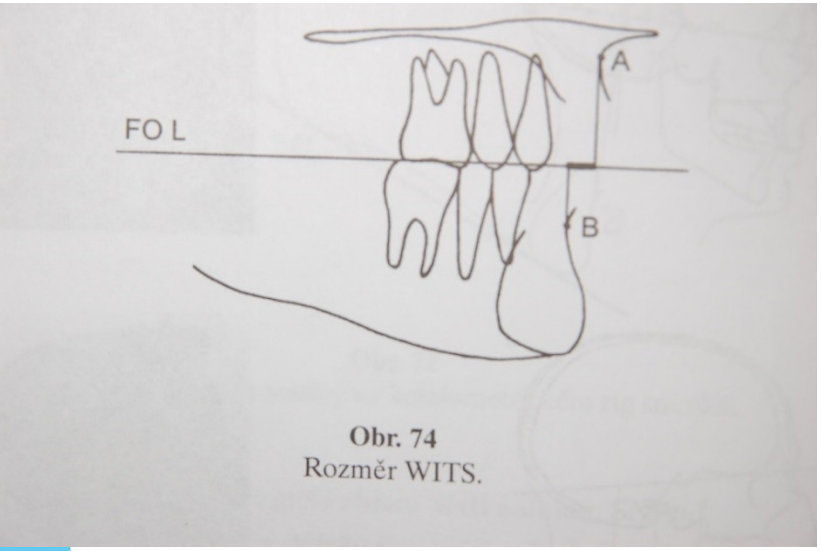



Obr. 80




# skeletal analysis

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

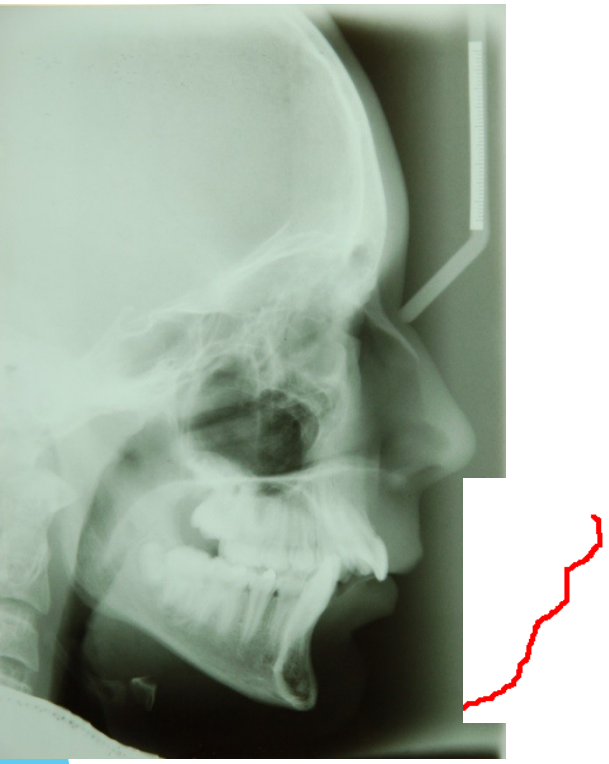



**Obr. 74**
Rozměr WITS.

# Skeletal class I

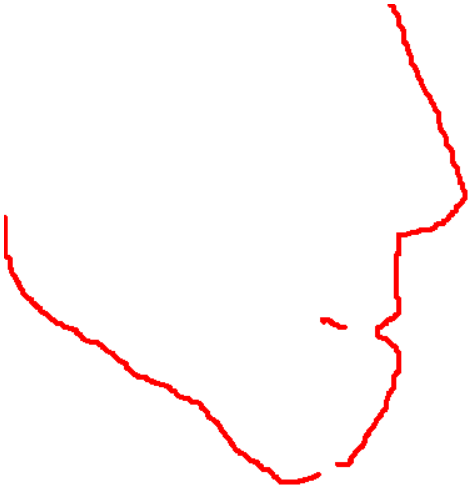
# Skeletal class II

**with protrusion of incisors**



**with retrusion of upper incisors**

# Skeletal class III

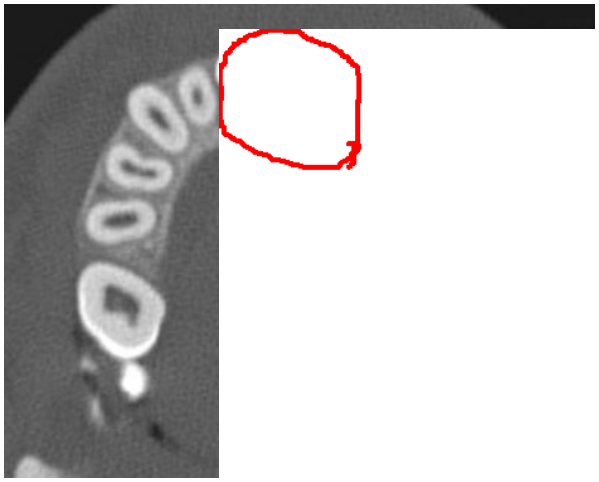


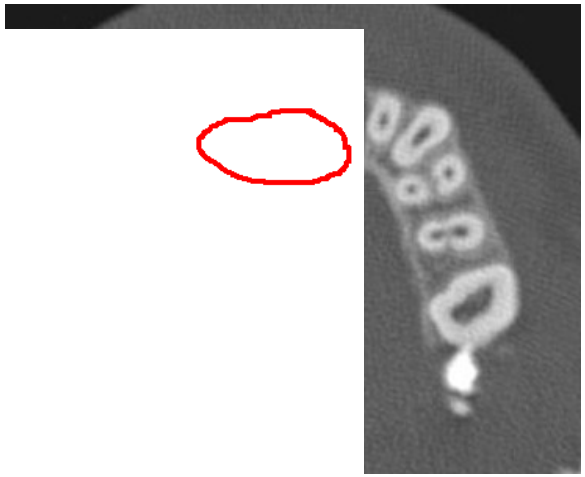
# Diagnostic examination

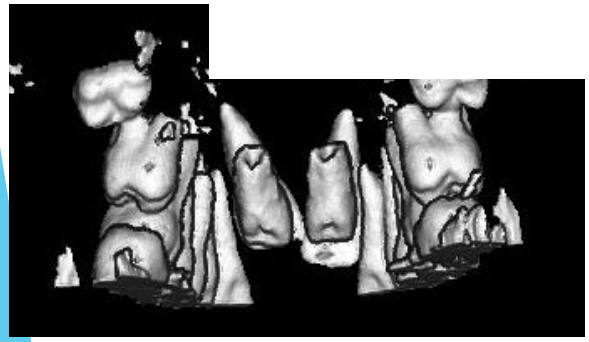
## 4. RADIOGRAPHS

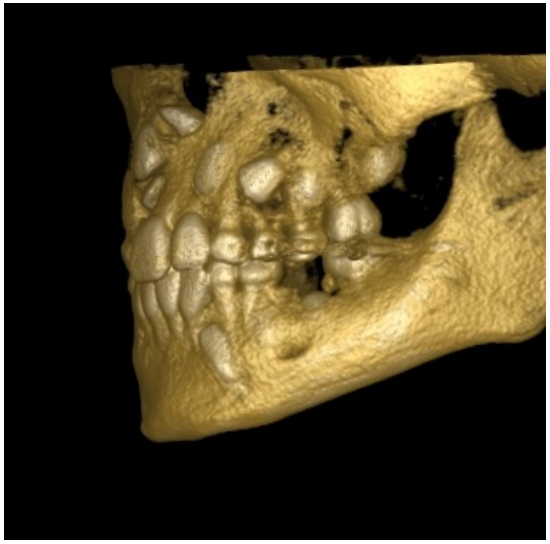
### c] Other radiographs

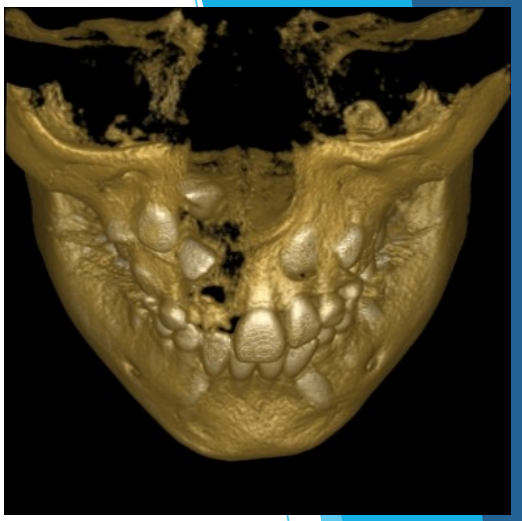
- Bitewing – caries detection
- Hand wrist – detection of skeletal age
- Computer tomography –CT scan [impacted tooth, ankylosed tooth, difficult skeletal anomalies
- Digital imaging – computer generated model reconstructed from the initial imaging data

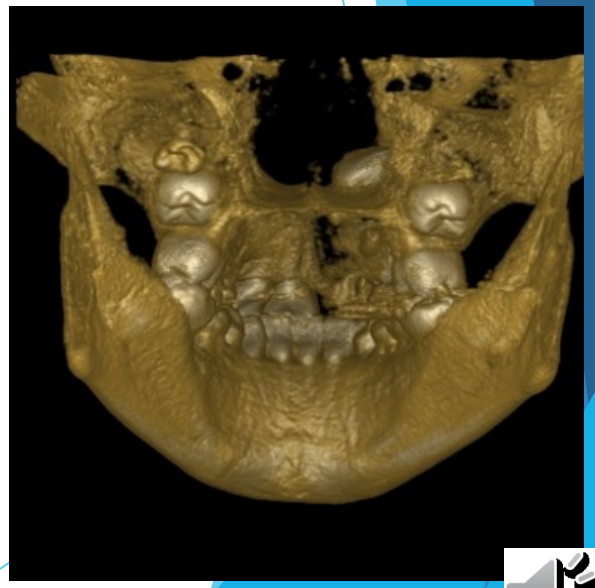












# Diagnostic examination

## 5. PHOTOGRAPHS

- extraoral photographs - frontal
  - profile
  - smile
- Intaoral 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

# 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 progenia
-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

Mainly hereditary anomalies- mandibular prognatism in the Hapsburg family

# Etiology of orthodontic anomalies

Mainly hereditary anomalies – skeletal class III

# Etiology of orthodontic anomalies

# Etiology of orthodontic anomalies

Mainly hereditary anomalies – skeletal deep bite

# Etiology of orthodontic anomalies

- Mainly hereditary anomalies- skeletal open bite

# Etiology of orthodontic anomalies

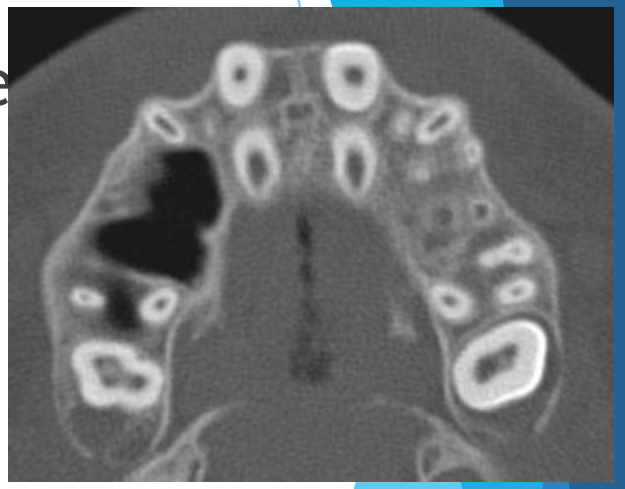
Mainly hereditary anomalies – primary crowding

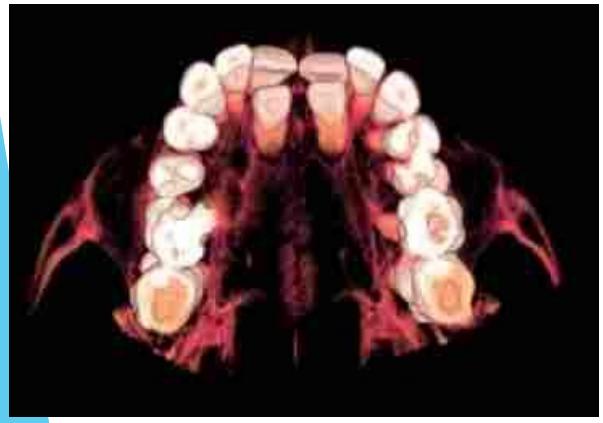
# Etiology of orthodontic anomalies

- Mainly hereditary anomalies- hypodontia

# Etiology of orthodontic anomalies

Mainly hereditary anomalies- hype





# Etiology of orthodontic anomalies

hyperodontia

# 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

- Clefts lip and palate

# 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

# 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]

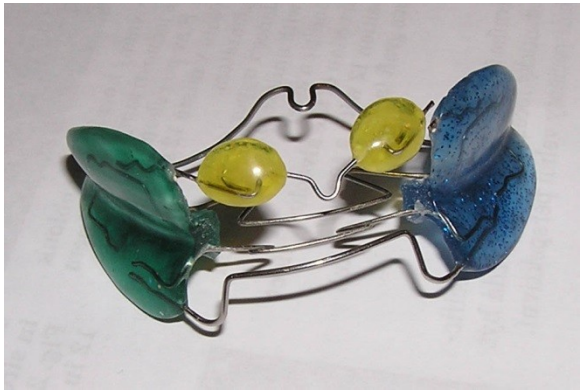
-Treatment the dental arch shape

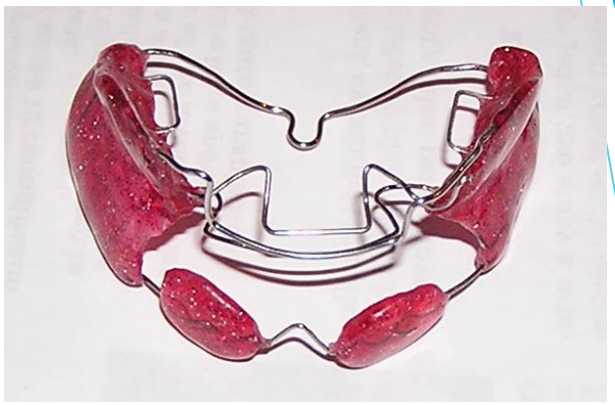
- Individual resin plates
- Active elements : springs, screws, wire bows

# Removable active appliances

# Removable appliances - active

# Removable functional appliances

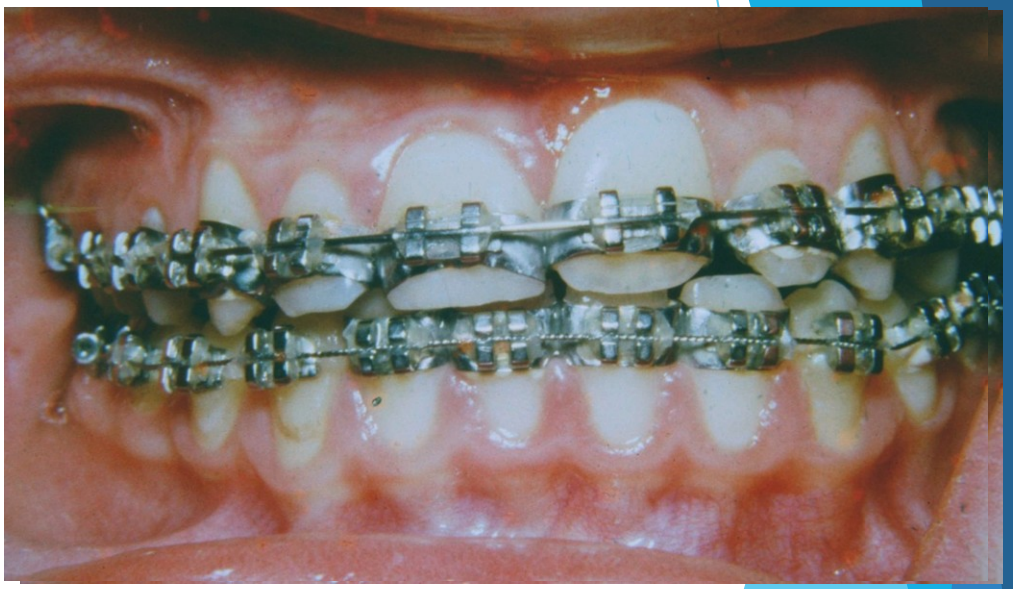




# Removable appliances-passive

# Fixed appliances

## -History



# Orthodontics brackets

## Stainless steel brackets

### Advantages

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

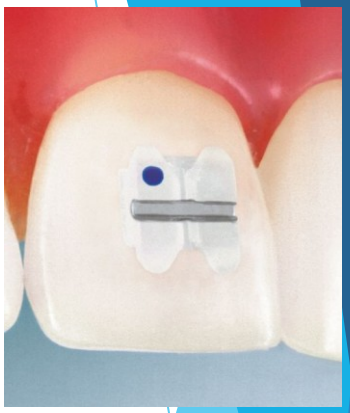
### Disadva

- Aes

# Stainless steel brackets

# Orthodontics brackets

## Ceramic brackets



Advantages:

- Aesthetics

Disadvantages:

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

# Ceramic brackets

# Ceramic brackets

# Orthodontics brackets

Sapphire brackets

Advantages

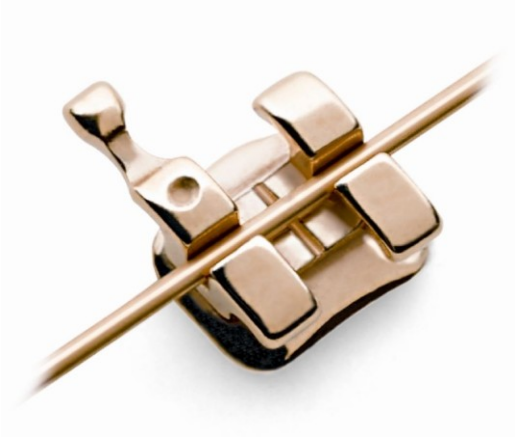
- aesthetic

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

# Orthodontics brackets

## Lingual brackets – 2D,3D

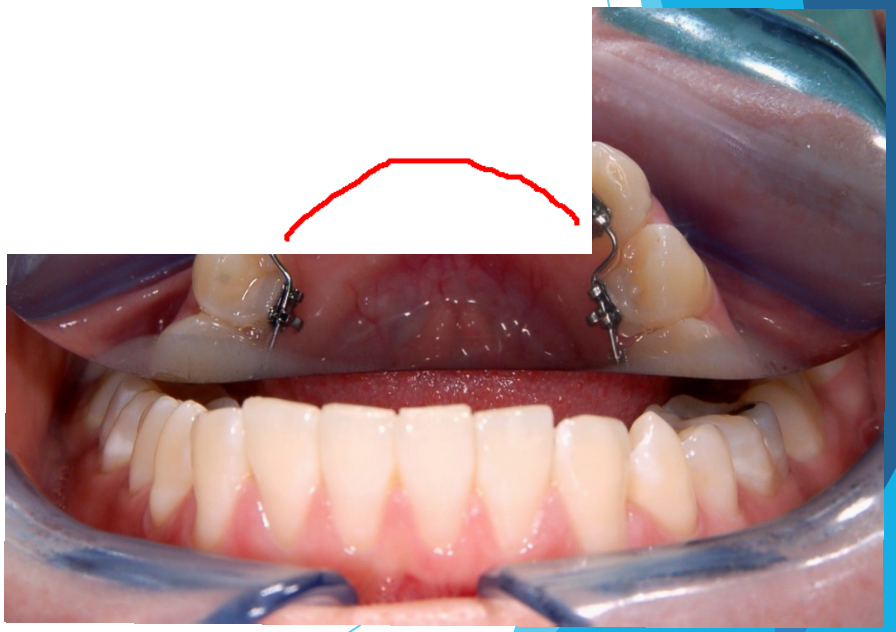
Advantages:

- Aesthetics

Disadvantages:

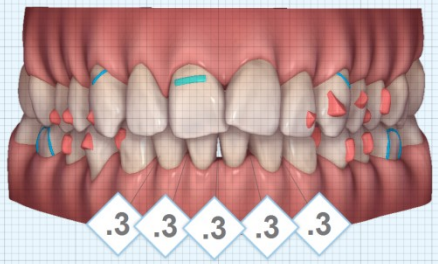
- unsuitable for all types of defects
- Difficulty hygiene
- (patient discomfort)

# Lingual bracket



# Orthodontics brackets

Decorative brackets


Software
ovements, actual treatment results may vary.
eat and the actual treatment plan are determined by your doctor.

invisalign®

# Fixed lingual retainer

Case 1 – hyperodontia - supernumerrary incisor, cowding

# Case 1

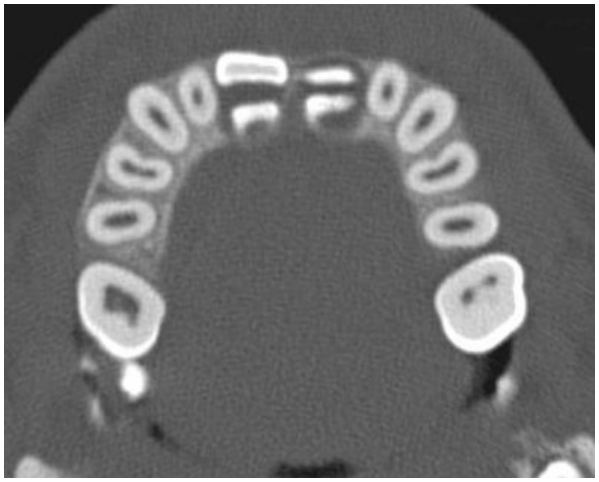
before

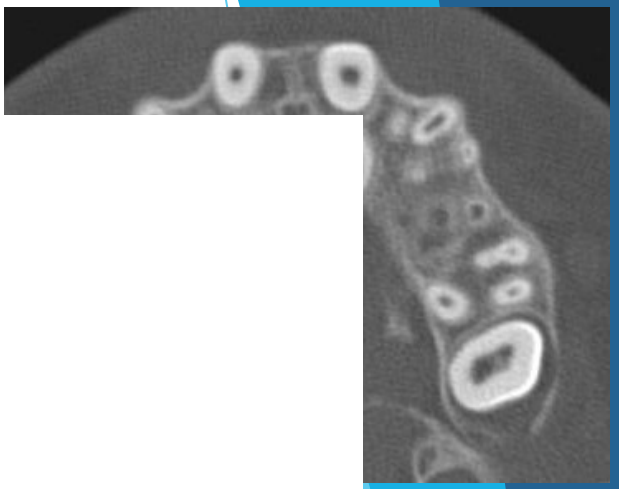
after treatment

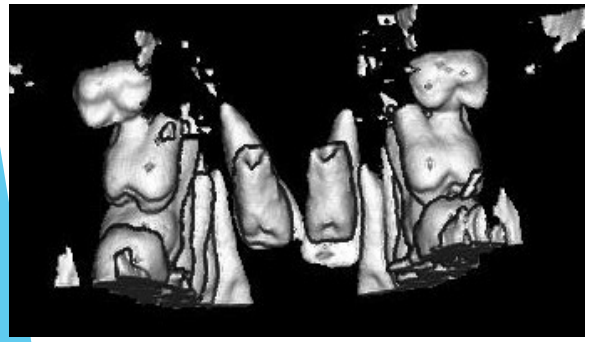
- Treatment – fixed appliance – 11 months
- Retention – removable appliance

# Case 2 – hyperodontia – supernumerrary 2 incisors

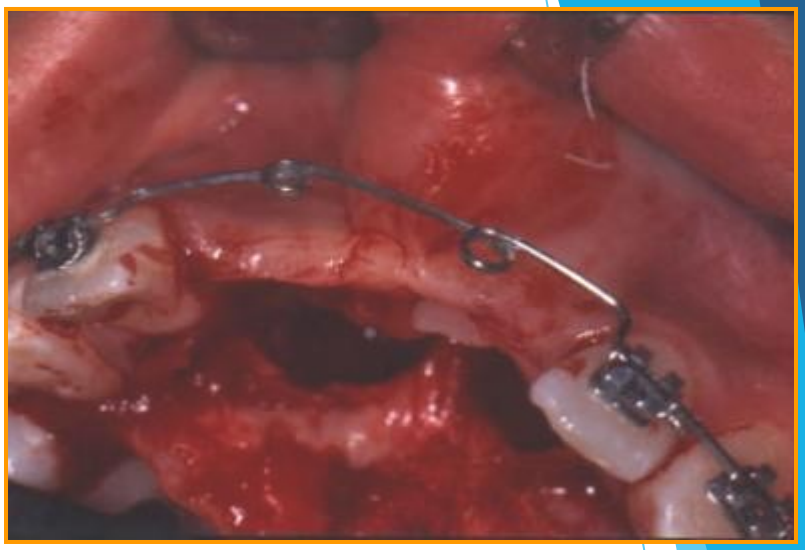
# CBCT







# Extraction of the supernumerrary incisors

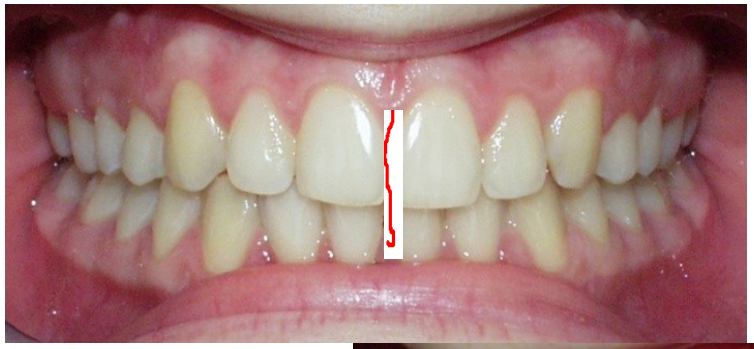


Case 2 - before after treatment

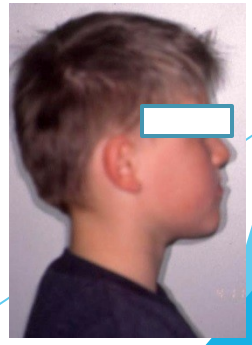
- treatment – 16 months

# Case 3 – deep bite, crowding

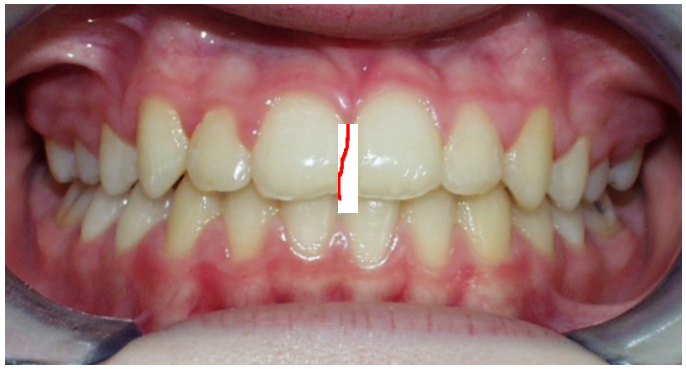
# Case 3 – deep bite, crowding – after treatment with fixed appliance – 1,5 year

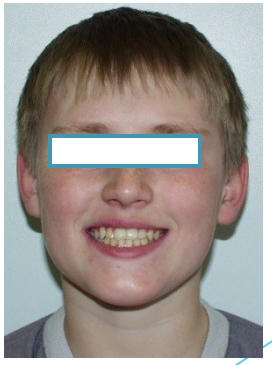


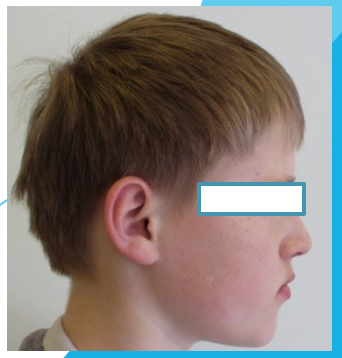
# Case 4 – inverted bite, crowding, vestibular eruption canine



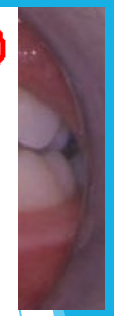
Case 4 – inverted bite, crowding, vestibular eruption canine – after treatment with fixed appliance – no extraction, 2 years

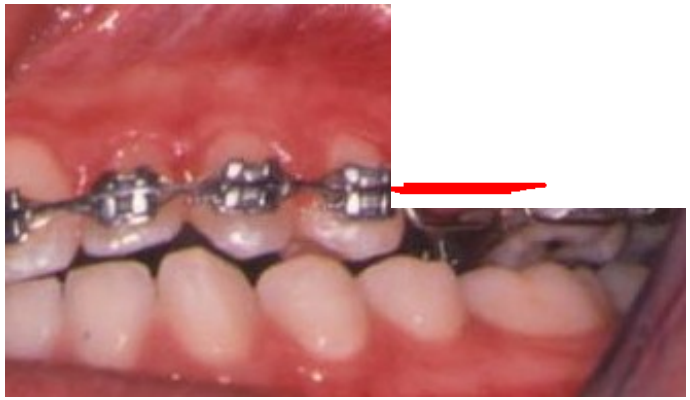


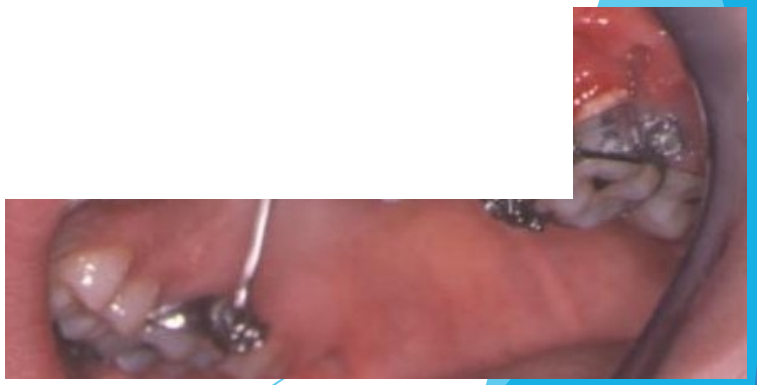




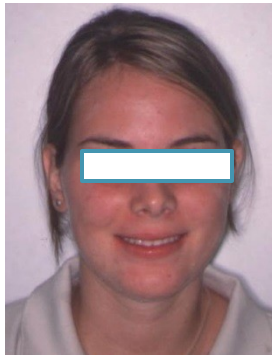
# Case 5 – retention of second premolars no space for eruption



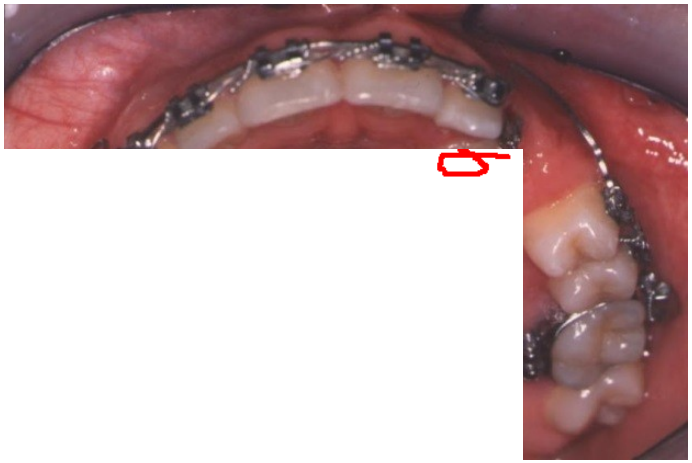


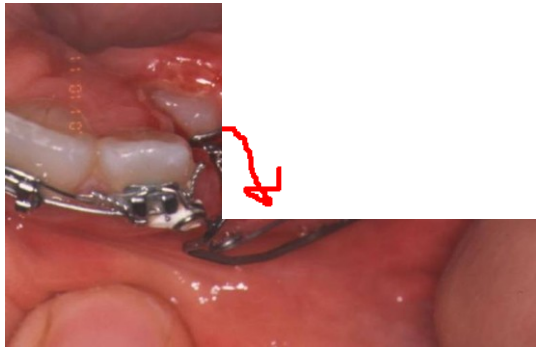


Case 5 – retention of second premolars no space for eruption – after treatment – epanzion, no extraction – 2 years

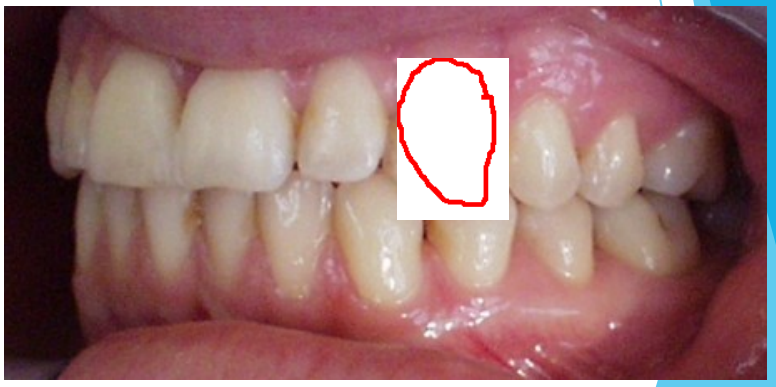


# Case 6 – retention of canine, palatal eruption

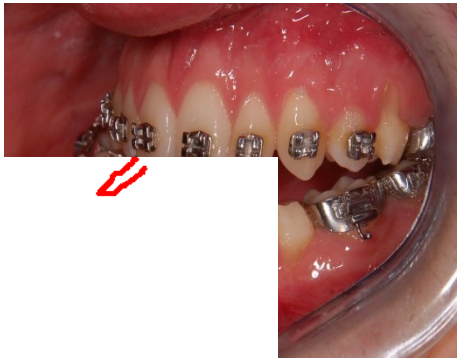


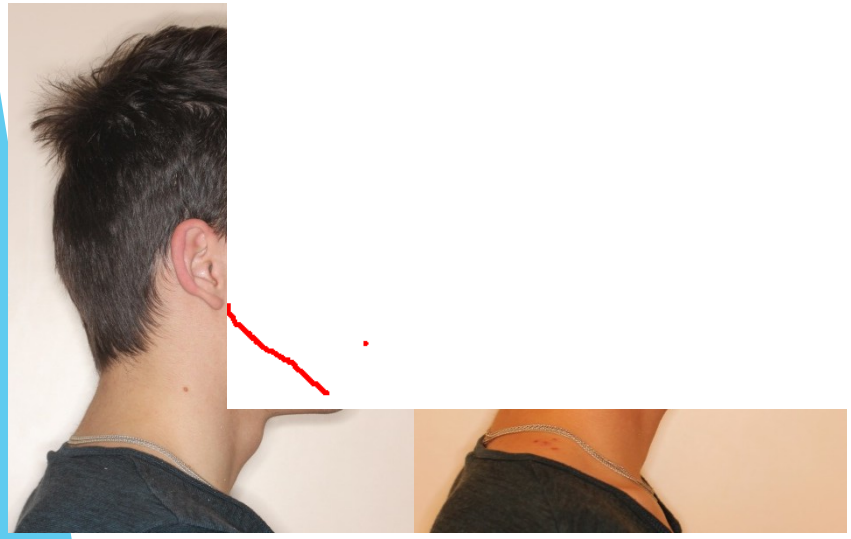


Case 6 – after treatment – expanzion, alignment canine



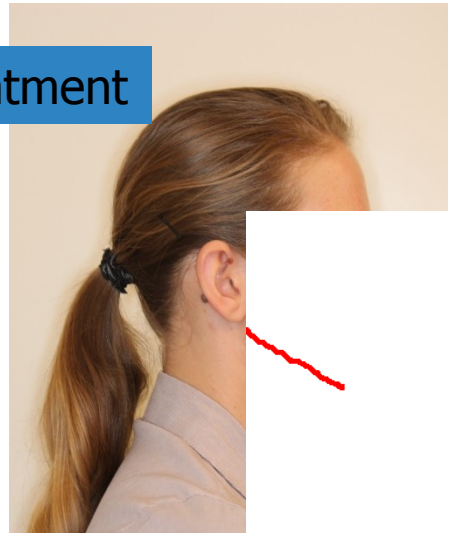
Case – orthodontic treatment with surgery correction – mandibular progenia, skeletal class III, open bite, crowding



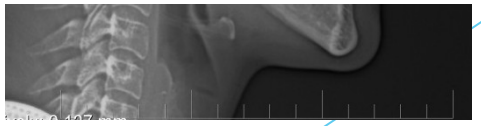


Case – orthodontic treatment with surgery correction – mandibular progenia, skeletal class III, open bite, crowding

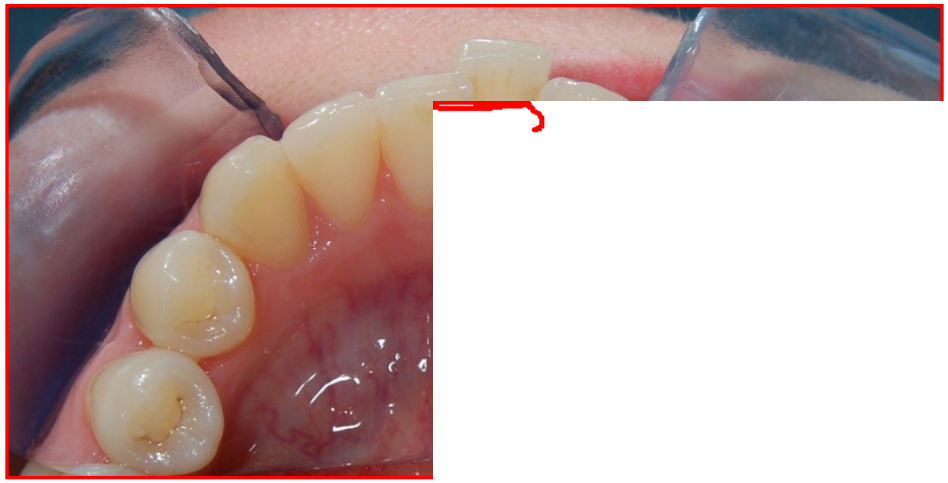
Before treatment

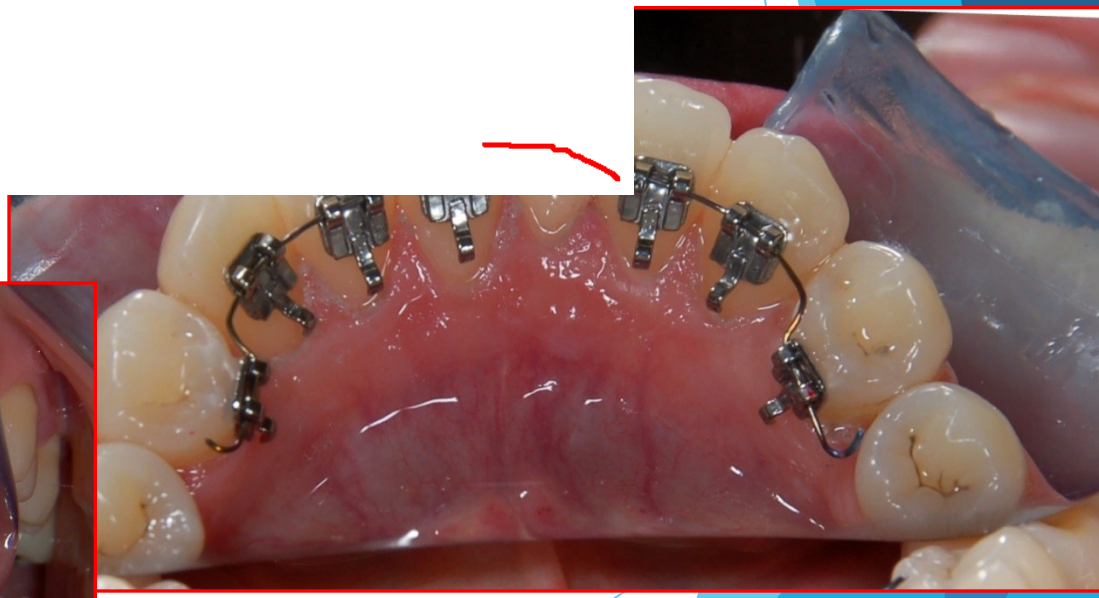


After treatment

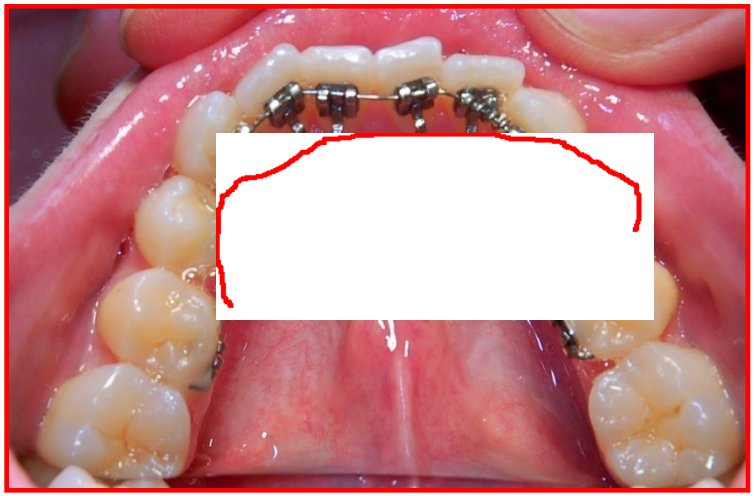


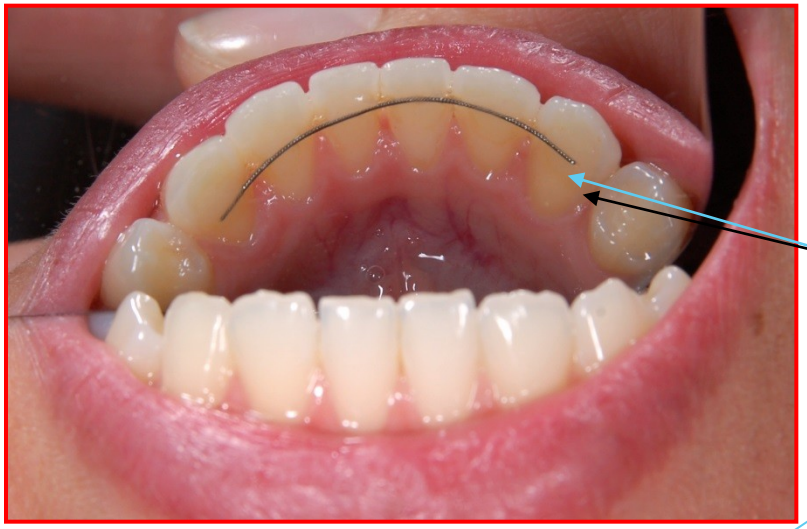
# Orthodontic treatment with lingual appliance





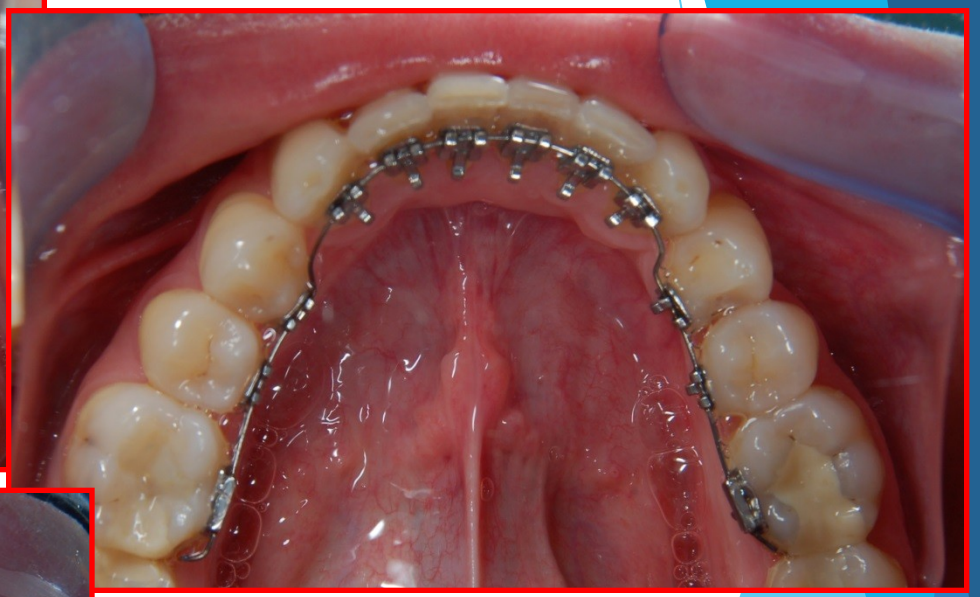
# Orthodontic treatment with lingual appliance





Fixed retainer after treatment

# Treatment - crowding - with lingual appliance



# Thank You four Your attention

Questions – email – alena.brysova@fnusa.cz

Consultation – Orthodontic department - St. Anne's Hospital, building D2b – Thursday 1-2 p.m.