

1. Collection of Information

1. Medical and Dental History

2. Extraoral Examination

3. Functional **1 Patient's History**

(TMJ, orofacial muscles, tongue position, respiration, habits)

4. Intraoral Examination and Study Models

5. Radiographs

- panoramic
- cephalometric

- 
- ▶ **ADDRESS AND OCCUPATION**-recording of address and occupation helps in evaluation of socio-economic status of the patient and the parents.
 - ▶ **CHIEF COMPLIANT** -the patient's chief complaint should be recorded in his/ her own words.
 - ▶ This helps the clinician in identifying the priorities and the desires of the patient.

History

- Chief complaint:
 - It is really important to write the reason for the visit in the terms described by the patient
 - Ex: I have an overbite....
 - Ex: My teeth are crooked..
- Medical, Dental and Familial History
 - This allows you to detect problems which are environmental and or genetic

- 
- ▶ **MEDICAL HISTORY** - full medical history is recorded before orthodontic treatment.
 - ▶ Few medical conditions contraindicate the use of orthodontic appliances such as;
 - Epilepsy
 - History of blood dyscrasias
 - Diabetic patient
 - Rheumatic fever
 - Cardiac anomalies
 - Physically and mentally handicapped children

- 
- ▶ The medical history should include information on drug usage.
 - ▶ The use of certain drugs like aspirin may impede orthodontic tooth movement.
 - ▶ **DENTAL HISTORY** -it includes information on the age of eruption of the deciduous and permanent teeth, decay, history of extraction, restoration and trauma to dentition.
 - ▶ **Past dental history** helps in evaluation of patient and parent's attitude towards treatment.

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- ▶ **POST NATAL HISTORY** -it includes information on the type of feeding, presence of habits and on the milestones of normal development.
 - ▶ **FAMILY HISTORY**- class 11, class 111 malocclusions and congenital conditions such as clefts of lip & palate are inherited.
 - ▶ Family history should record details of malocclusion existing in other members of the family.

Extraoral examination

- Determine the harmony of facial structures
- Judge facial symmetry
- Analyze the smile (Gummy smile ?, complete or incomplete lip closure)
- Evaluate the position of the teeth in relation to the soft tissue of the face

EXTRA ORAL EXAMINATION

SHAPE OF THE HEAD:

- ▶ A) **MESOCEPHALIC**-average shape of the head. posses normal dental arches
- ▶ B) **DOLICOCEPHALIC**-long and narrow head . They have narrow dental arches
- ▶ C) **BRACHYCEPHALIC**-broad and short head. broad dental arches



Mesocephalic, dolichocephalic, brachycephalic

Brachycephalic

Tendency for a deep bite



Dolichocephalic

Tendency for an open bite



Glabella
Nose
Chin

- ▶ **STRAIGHT PROFILE**-the two lines form nearly straight line.
- ▶ **CONVEX PROFILE**-the two lines form an angle with concavity facing the tissue.
- ▶ This kind of profile occurs as a result of prognathic maxilla retrognathic mandible as seen in **CLASS I, DIVISION I MALOCCLUSION**.



STRAIGHT PROFILE



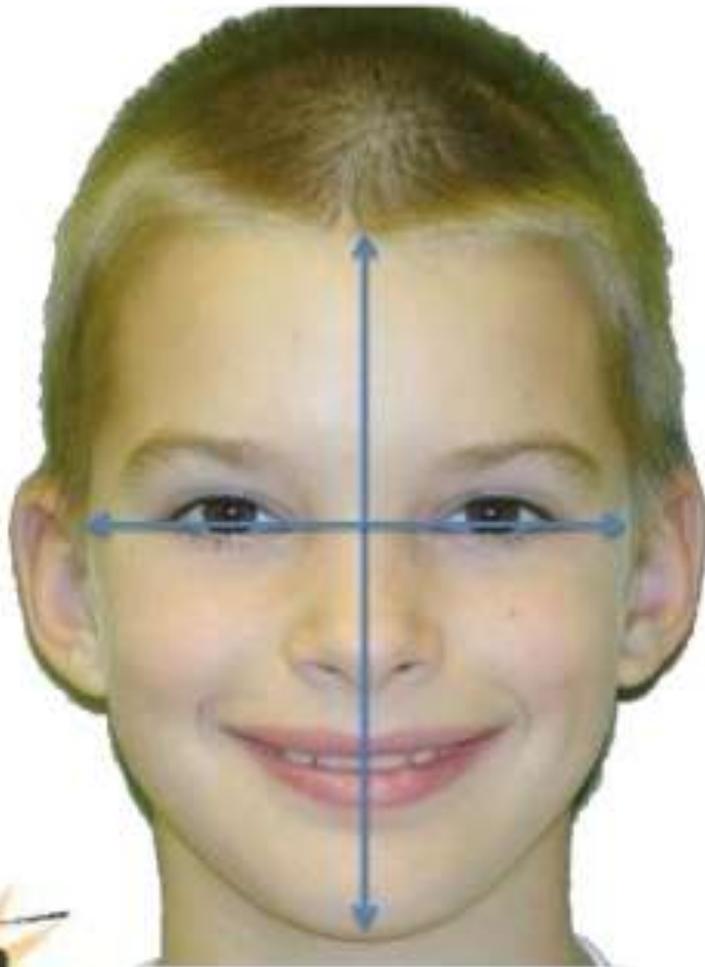
CONVEX
PROFILE

- ▶ **COCAVE PROFILE**-the two reference lines form an angle with convexity towards tissue.
- ▶ This type of profile is associated with a prognathic mandible or retrognathic maxilla as in **CLASS II MALOCCLUSION**.

Glabella
Nose
Chin



Normocephalic



- The length and width of the face are in ideal proportions
- The growth pattern is most probably favorable

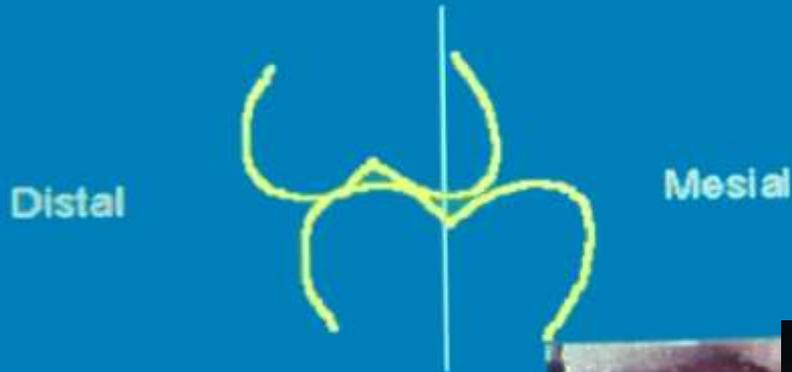


Orthodontic directions

- Orthodontic directions
- Sagittal (mesiodistal anomalies-Angle classification)
- Vertical (deep bite, open bite)
- Transversal (narrow)

Angle Class I.= neutral occlusion

Class I Molar



Angle classification
based on: anteroposterior (sagittal)
relationship of the jaws

Class I. Cuspid



Two malocclusions which present with a Class I malocclusion (or almost)

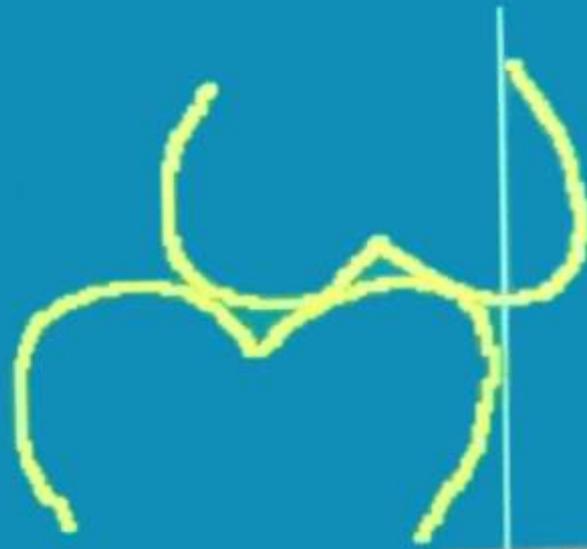
Class I. doesn't mean that the denture is perfect (crowding, diasthema, ectopic teeth, rotated teeth, impaction etc.)



Angle II.= distocclusion

Class II Molar

Distal



Mesial



Angle II/1

Overjet

Distocclusion

The mandible is usually behind
Sometimes the prognathism of the
upper jaw is also responsible for the
anomaly

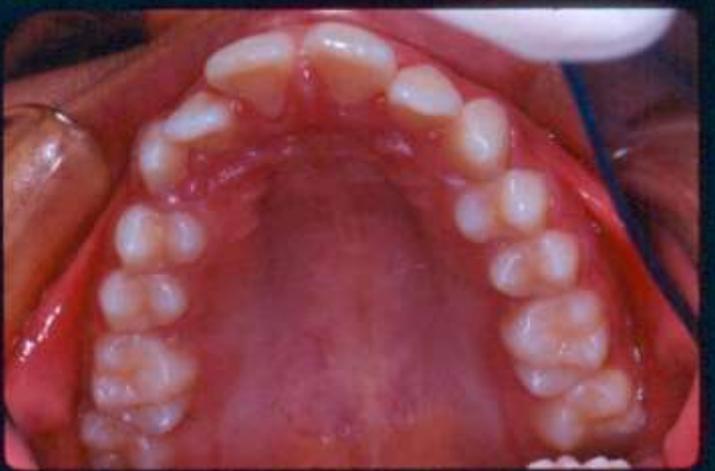
Deep bite 70-80 %

Mouth breathing (often)

Incomplett lip closure

Often acquired anomalies
(bad habit, tongue)

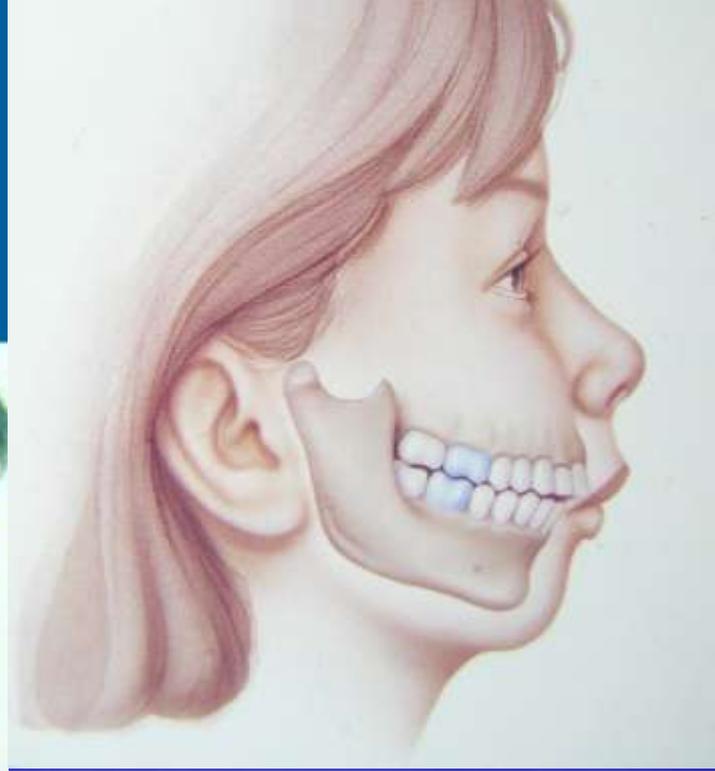




Angle II.2.



Distocclusion
Overbite (always)
Retrusion of upper incisors



Divisions of Class II
Division 2



Angle II./2 rendellenességek jellemzői

- Hereditary anomaly
- Excessive function of the upper lip
- Pronounced sulcus mentolabialis (deep bite)
- Nose breathing
- „Forced distocclusion”

Divisions of Class II Division 2



Angle III – progenie - mesiocclusion



CLASS III MALOCCLUSION



**Real III. class: macrogenia or
anterior position of the mandible**

ANTERIOR CROSSBITE

Pseudoprogeny: when the maxilla is responsible for the anomaly (micrognathia) or early contact of the cups forces the mandible forward

The six keys of occlusion (by Andrews) are:

- Molar inter-arch relationship
- Mesio-distal crown angulation
- Labio-lingual crown inclination
- Absence of rotation
- Tight contacts
- No (or mild) curve of Spee

Angle subdivision - if the occlusion on the right side and left side are different



By narrowing of the arches the lateral cusps forces the mandible to lateral direction



Skeletal assymetry



7. Number of teeth and sequence of dental eruption

- What is normal?
- Can we take advantage of the sequence of eruption?
- Is the timing early or late?



Patient age 16 years: slow eruption and multiple impacted teeth

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(TMJ, orofacial muscles, tongue position, respiration, habits)

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FUNCTIONAL EXAMINATION

- ▶ It is now established that normal function of stomatognathic system promotes normal growth and development of oro-facial complex.
- ▶ The functional examination should include the following:
 1. Assessment of postural rest position and inter occlusal space.
 2. Path of closure
 3. Assessment of respiration
 4. Assessment of TMJ
 5. Examination of swallowing
 6. Examination of speech

EVALUATION OF PATH OF CLOSURE

The path of closure is the movement of mandible from the rest position to habitual occlusion .

- **Forward path of closure:** a forward path of closure occurs in patients with mild skeletal and prenormalcy or edge to edge incisor contact. In such patients ,the mandible is guided to a more forward position to allow the mandibular incisors to go labial to the upper incisors. **III Class**
- **Backward path of closure:** class 11 ,division 2 exhibit premature incisor contact due to retroclined maxillary incisors. Thus the mandible is guided posteriorly to establish occlusion
- **Lateral path of closure :** lateral deviation of mandible to left or right side is associated with occlusal prematurities and a narrow maxillary arch

EXAMINATION OF LIPS

- ▶ The upper lip covers the entire labial surface of upper anteriors except the incisal 2-3 mm
- ▶ The lower lip covers the entire labial surface of lower anteriors and 2-3 mm of incisal edge of upper anteriors.

EVALUATION OF SWALLOWING

In a new born, tongue is relatively large and protrudes between the gum pads and takes part in establishing the lip seal .this kind of swallow is called infantile swallow and is seen till one and half to two years of age .

Infantile swallow is replaced by mature swallow as the buccal teeth start erupting. The persistence of infantile swallowing can cause malocclusion .thus the swallowing pattern of the individual should be examined.

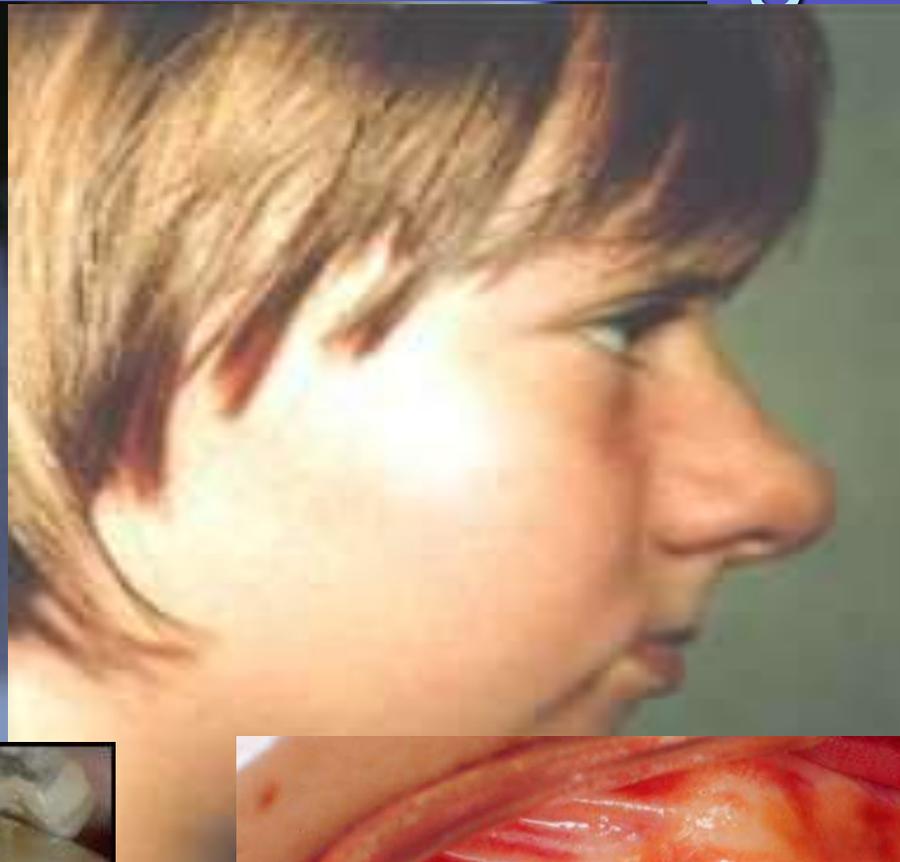
The persistence of the infantile swallow is indicated by the presence of the following features:

- a. Protrusion of the tip of tongue
- b. Contraction of perioral muscles during swallowing
- c. No contact at the molar region during swallowing

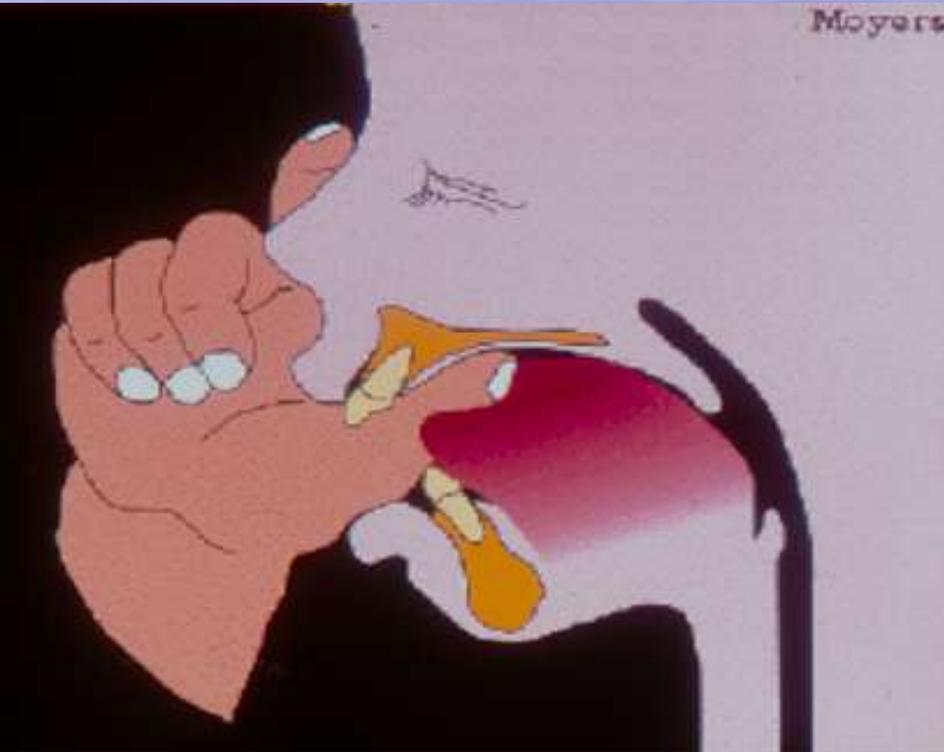
Tongue –thrust swallowing



Lip-pressure swallowing



Thumb sucking



Ujjszopás

- nyitott harapás
- felső metszőfogak protrusioja
- alsó metszőfogak retrusioja
- (néha distalharapás)



-Consequences of thumb sucking

- Open bite**
- Protrusion of upper incisors**
- Retrusion of lower incisors**
- Distalocclusion**



Mouth breathing

the nasal cavity is usually closed (nasal gland, polyp etc.)



Upper incisors are protruded
Open bite
Inflamed marginal gingiva



- ▶ **INCOMPETENT LIPS** - they are morphologically short lips which do not form a lip seal in a relaxed state.
- ▶ The lip seal can only be achieved by active contraction of perioral and mentalis muscle.



Oral breathing

- **Observation**: in nasal breathers the external nares dilate during inspiration. In mouth breathers, there is either no change in the external nares or they may constrict during inspiration.

EXAMINATION OF T.M.J.

The functional examination should routinely include auscultation and palpation of temporomandibular joint and musculature associated with mandibular opening.

The patient should be examined for the symptoms of temporomandibular joint problems like clicking, crepitus, pain of masticatory muscles, limitation of jaw movement, hyper-mobility and morphological abnormalities.

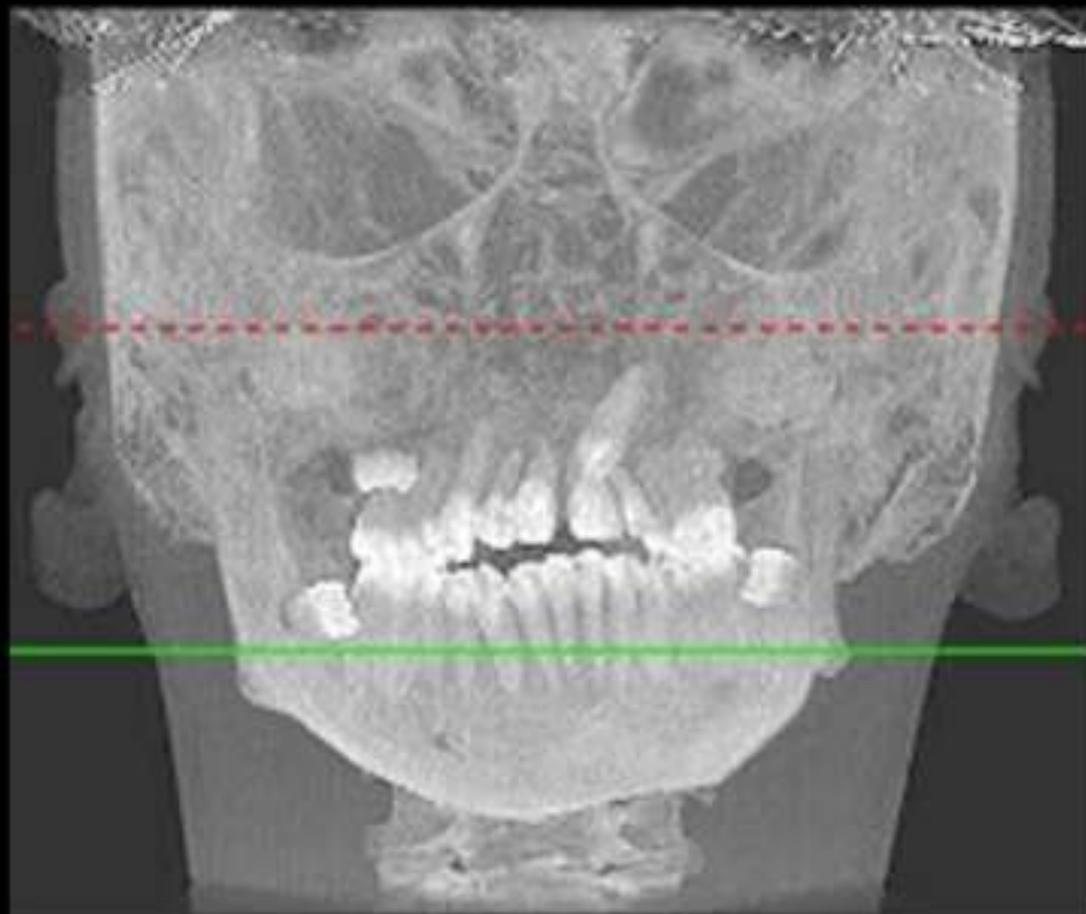
The maximum mouth opening is determined by measuring the distance between the maxillary and mandibular incisal edges with mouth wide open.

The normal inter-incisal distance is 40-45 mm.

Functional Examination

A malocclusion whose origin is skeletal with joint degeneration.

It can be seen that the condyle on the left is actively resorbing



SPEECH

Certain malocclusions may cause defects in speech due to interference with the movement of tongue and lips .this should be observed while talking with the patient .

The patient can be asked to read out from a book or asked to count from 1-20 while observing the speech.

Patients having tongue thrust habit tend to lisp while cleft palate patients may have a nasal tone

Measurements

- Arch perimeter analysis (place analysis)
- Pont- index
- Schmuth- index
- Moyers- index
- Bolton analysis (77,2%)
ISD 75.5%-78,9%

Place analysis

- The lower jaw is more important, because we are not able to increase the size of the mandible !!!

Is this crowding a concern?



By space analysis we compare the necessary (calculated) place with the actual (available) place in the denture.

Inferences

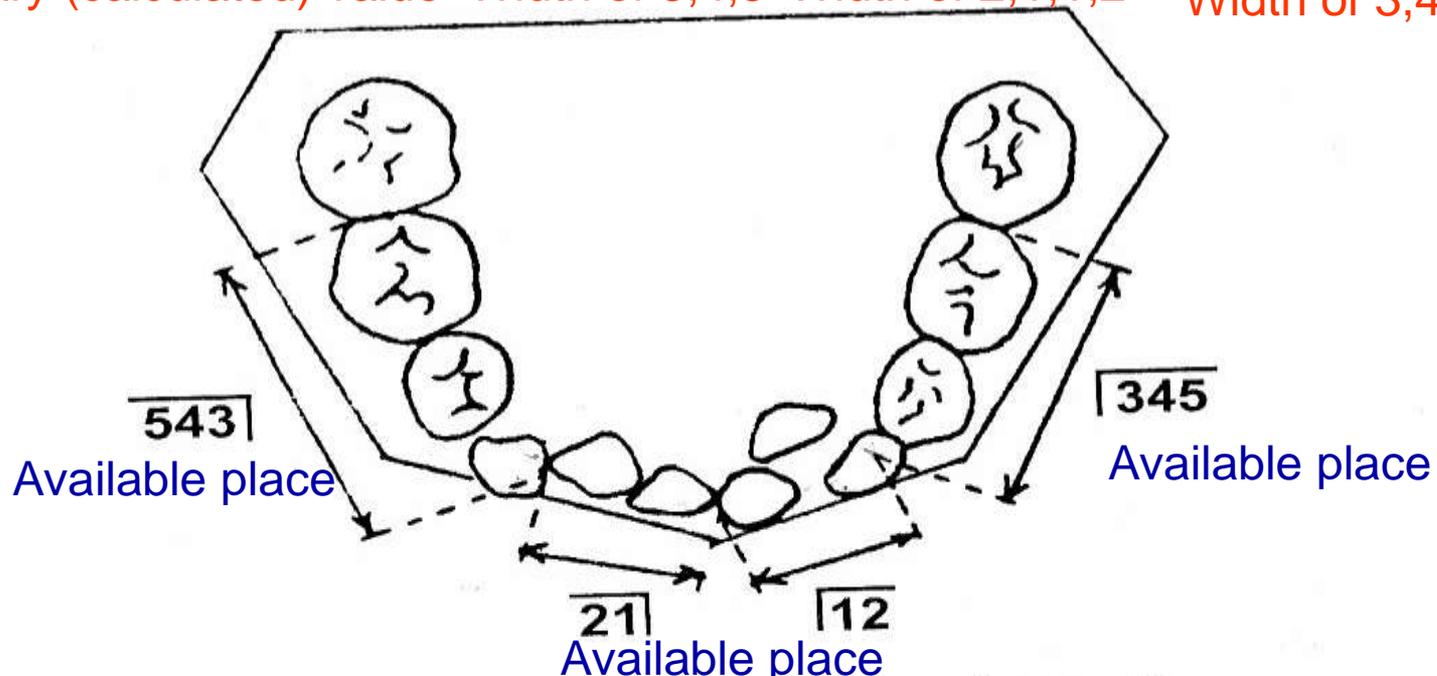


Difference between the measured & calculated values determines the needs for expansion

- 1) if measured value is less, expansion is required or extraction
- 2) if measured value is more, no need for expansion

Steiner analysis – place analysis

Necessary (calculated) value \neq Width of 3,4,5 Width of 2,1,1,2 Width of 3,4,5



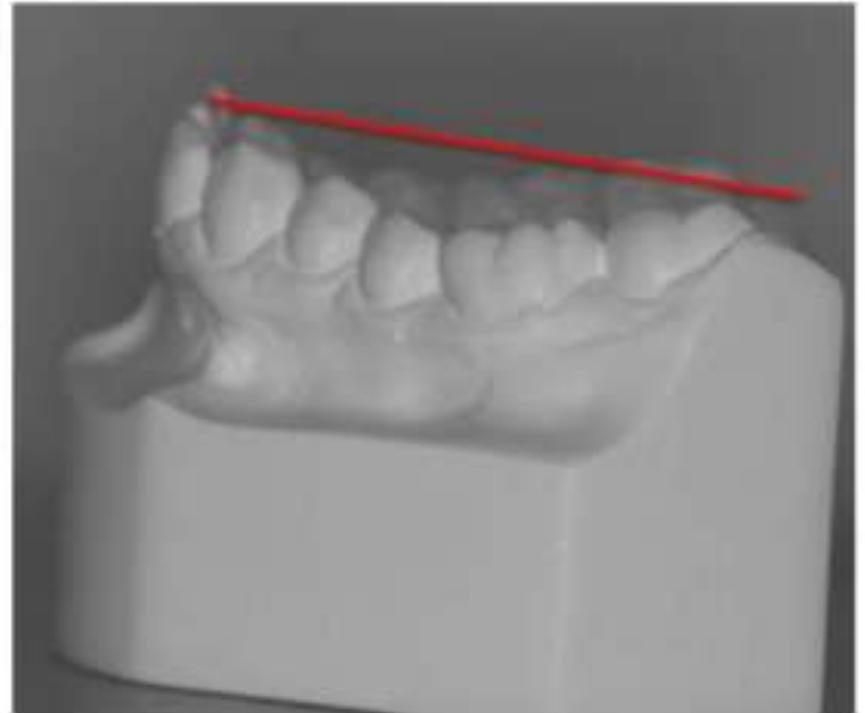
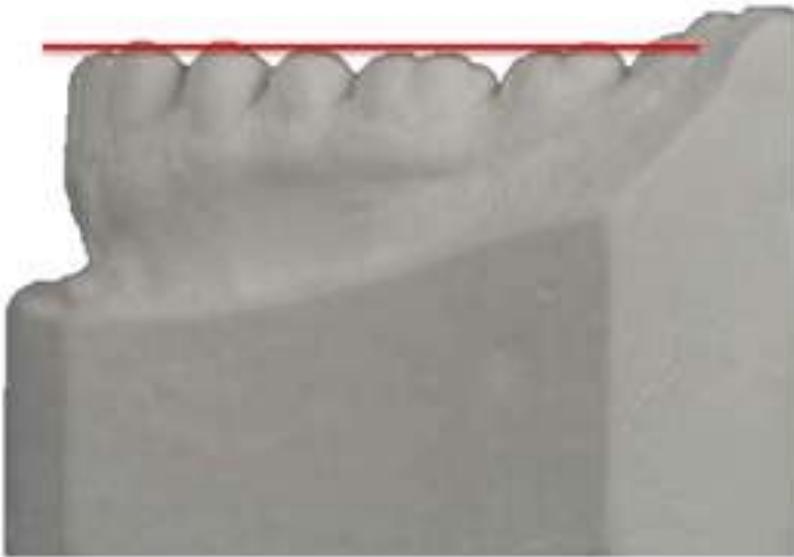
	543	21	12	345
Available(measured) value	22	11	9,5	20
Calculated value	24	12	11,5	23
Difference	-2	-1	-2	-3
Sum of differences	-3			-5

Curve of spee

Factors which influence the space analysis

- Flat (normal)
- Deep. Probably a skeletal malocclusion

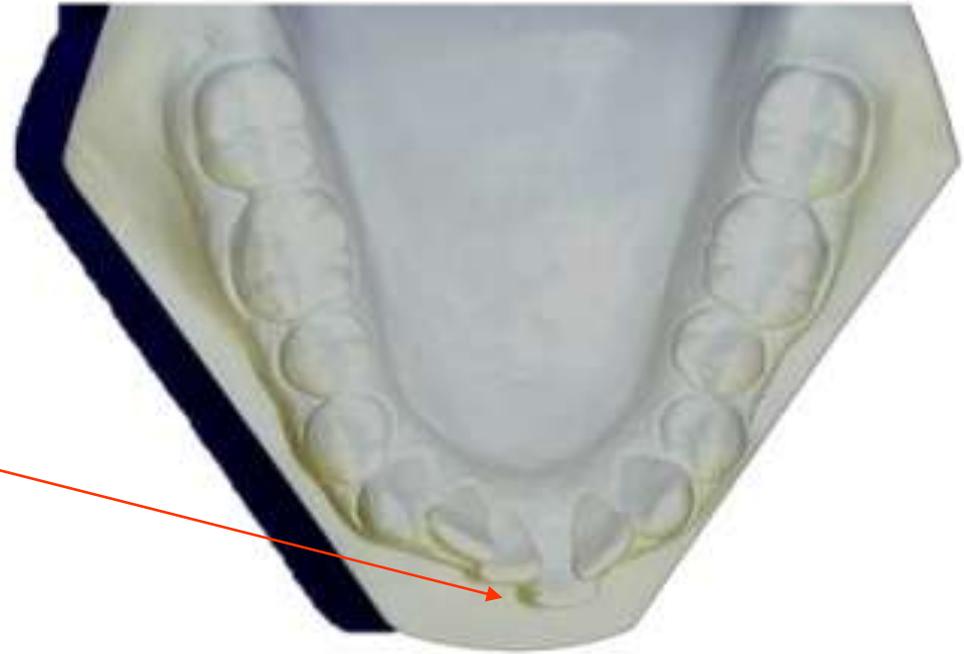
Straightening Curve of Spee needs 0,5 – 3 mm



Factors which influence the space analysis

- There are different factors to consider

Position of the incisors

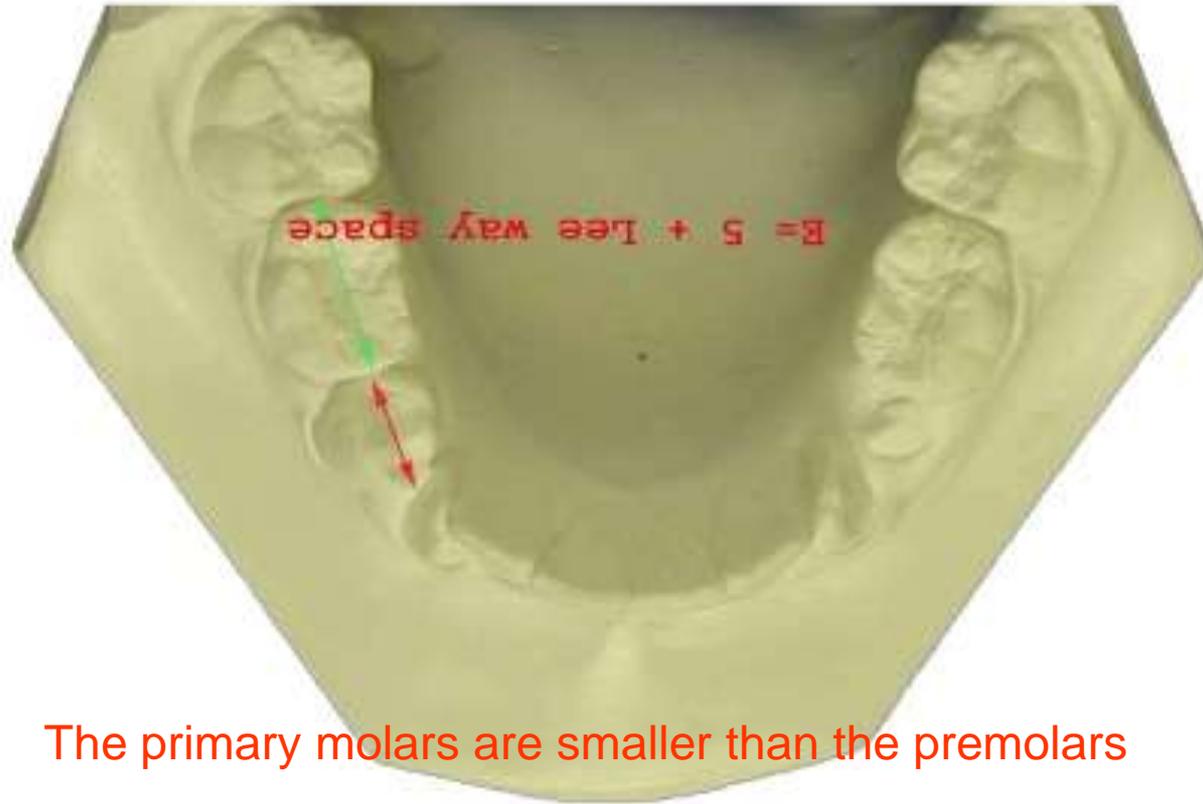


- Inclination of the lower incisors
- Non-apparent available space (non anatomic restorations)

- If 1 mm protrusion is possible it means 2mm place-winning
If 1 mm retrusion is necessary it means 2mm loss of place.

Leeway space

Mixed dentition



The primary molars are smaller than the premolars

The control and utilization of the Leeway space is really important

MOYER'S MIXED DENTITION ANALYSIS



In mixed dentition we don't know the size of the canines and premolars according to Moyer a high correlation exists among the sizes of different groups of teeth in an individual thus by measuring one group of teeth, it is possible to make a prediction of the other group of teeth

MOYERS MIXED DENTITION ANALYSIS

- ❖ The purpose of a mixed dentition analysis is to evaluate the amount of space available in the arch for the erupting permanent canines and premolars. In this analysis the size of the unerupted permanent cuspids and premolars are predicted from the knowledge of the sizes of **incisors**

Moyers- index

- Total mandibular incisor width width of 345

19.5	20.6, 20.1
20.0	20.9, 20.4
20.5	21.2, 20.7
21.0	21.3, 21.0
21.5	21.8, 21.3
22.0	22.0, 21.6
22.5	22.3, 21.9
23.0	22.6, 22.2
23.5	22.9, 22.5
24.0	23.1, 22.8

MANDIBULA		2	1	1	2	19,5	20	20,5	21	21,5	22	22,5	23	23,5	24	24,5	25	25,5	
FIÜK	95%					21,6	21,8	22	22,2	22,4	22,6	22,8	23	23,2	23,5	23,7	23,9	24,2	
	85					20,8	21	21,2	21,4	21,6	21,9	22,1	22,3	22,5	22,7	23	23,2	23,4	
	75					20,4	20,6	20,8	21	21,2	21,4	21,6	21,9	22,1	22,3	22,5	22,8	23	
	65					20	20,2	20,4	20,6	20,9	21,1	21,3	21,5	21,8	22	22,2	22,4	22,7	
	50					19,5	19,7	20	20,2	20,4	20,6	20,9	21,1	21,3	21,5	21,7	22	22,2	
LÁNYOK	95					20,8	21	21,2	21,5	21,7	22	22,2	22,5	22,7	23	23,3	23,6	23,9	
	85					20	20,3	20,5	20,7	21	21,2	21,5	21,8	22	22,3	22,6	22,8	23,1	
	75					19,6	19,8	20,1	20,3	20,6	20,8	21,1	21,3	21,6	21,9	22,1	22,4	22,7	
	65					19,2	19,5	19,7	20	20,2	20,5	20,7	21	21,3	21,5	21,8	22,1	22,3	
	50					18,7	19	19,2	19,5	19,8	20	20,3	20,5	20,8	21,1	21,3	21,6	21,8	
MAXILLA		2	1	1	2														
FIÜK	95					21,2	21,4	21,6	21,9	22,1	22,3	22,6	22,8	23,1	23,4	23,6	23,9	24,1	
	85					20,6	20,9	21,1	21,3	21,6	21,8	22,1	22,3	22,6	22,8	23,1	23,3	23,6	
	75					20,3	20,5	20,8	21	21,3	21,5	21,8	22	22,3	22,5	22,8	23	23,3	
	65					20	20,3	20,5	20,8	21	21,3	21,5	21,8	22	22,3	22,5	22,8	23	
	50					19,7	19,9	20,2	20,4	20,7	20,9	21,2	21,5	21,7	22	22,2	22,5	22,7	
LÁNYOK	95					21,4	21,6	21,7	21,8	21,9	22	22,2	22,3	22,5	22,6	22,8	22,9	23,1	
	85					20,8	20,9	21	21,1	21,3	21,4	21,5	21,7	21,8	22	22,1	22,3	22,4	
	75					20,4	20,5	20,6	20,8	20,9	21	21,2	21,3	21,5	21,6	21,8	21,9	22,1	
	65					20,1	20,2	20,3	20,5	20,6	20,7	20,9	21	21,2	21,3	21,4	21,6	21,7	
	50					19,6	19,8	19,9	20,1	20,2	20,3	20,5	20,6	20,8	20,9	21	21,2	21,3	

Ábra 5-17 Táblázat a Michigan-analízishez.

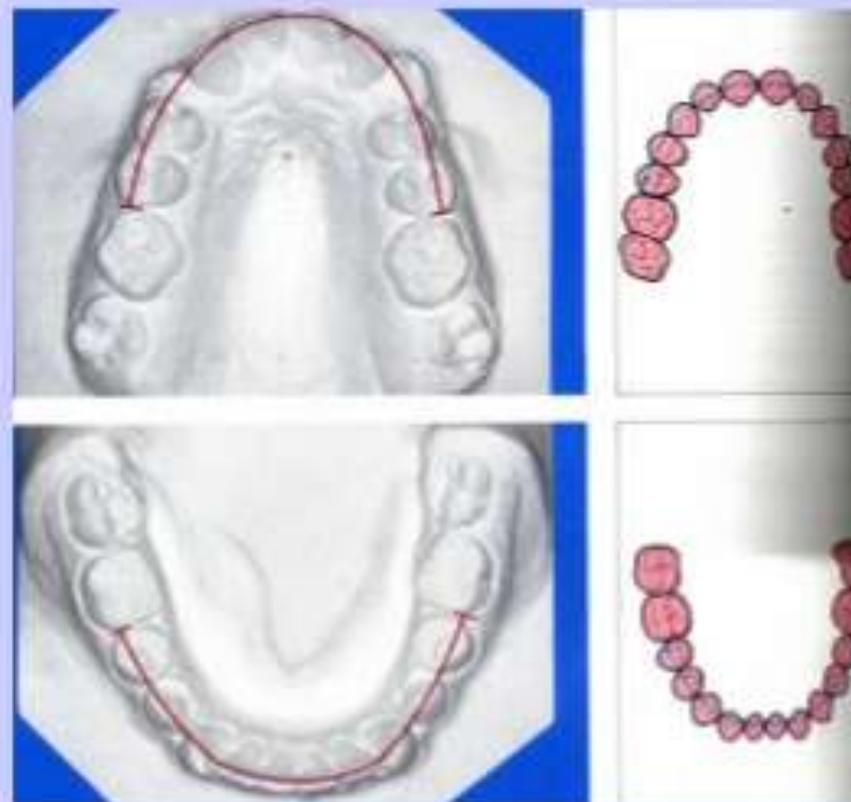
Moyers

A 75 %-os valószínűségű eredménnyel számolunk.

CAREY'S ANALYSIS / ARCH PERIMETER ANALYSIS

Carey's Analysis helps in determining the extent of discrepancy b/n arch length & tooth material discrepancy. It is performed in lower cast & same on upper is called arch – perimeter analysis.

The arch anterior to the first permanent molar is measured using soft brass wire touching mesial surface of 1st molar of one side and passed over buccal cusps of the premolar & along anteriors & is continued opposite side first molar



Determination of tooth material: m-d width of teeth anterior to 1st molar is determined and summed up.

The discrepancy is the difference b/n arch length & tooth material

DISCREPANCY

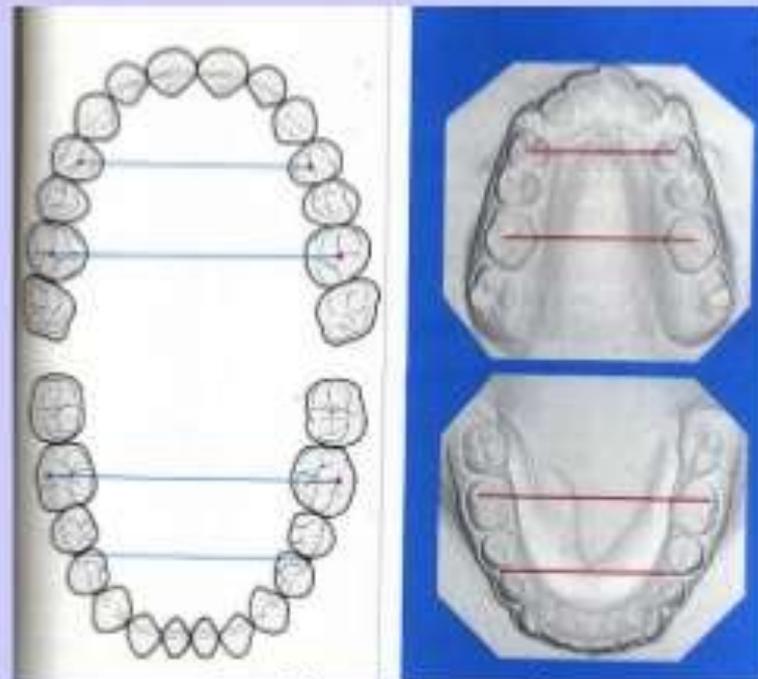
0-2.5 mm –In this proximal stripping can be carried out to reduce T.T.M.

2.5-5mm-Extraction of second premolar is indicated.

>5mm-Extraction of first premolar is indicated.

PONT'S ANALYSIS

- Pont's in 1909 presented a system whereby mere measurement of Incisors automatically gives width of the arch in premolar & molar region



Pont-index

Procedure

We have to decide how to create place = expansion or extraction ?

- The greatest width of incisors is measured with calipers recorded on a line, & their sums when recorded in millimeters this is termed as "*sum of incisors*" (SI)



➤ *Calculated premolar value (CPV)*

The expected arch width in the premolar region is calculated by formula:-

$$\frac{SI \times 100}{80}$$

➤ *Calculated molar value (MV)*

the expected arch width in the molar region:-

$$\frac{SI \times 100}{64}$$

The ideal arch width



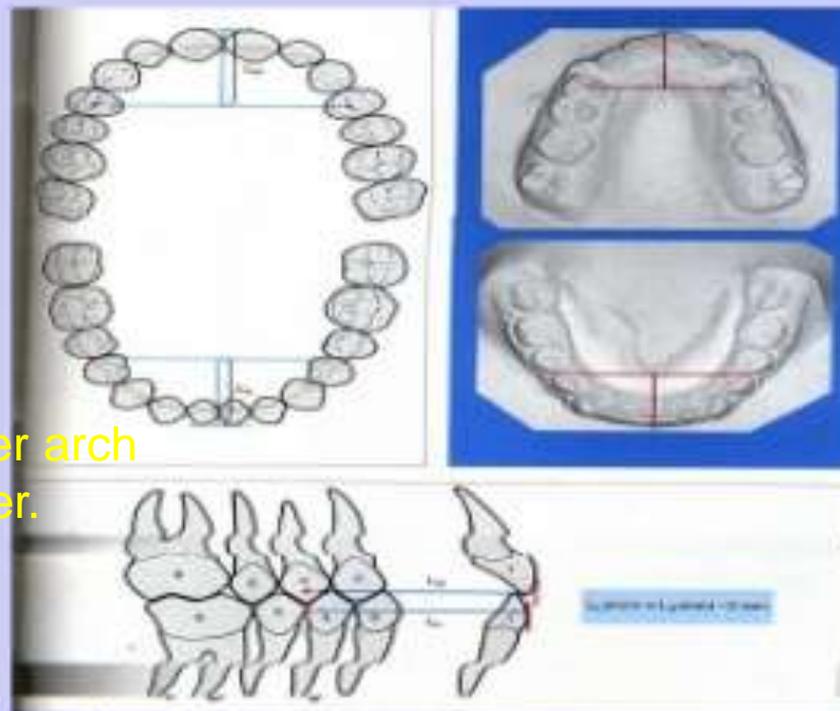
Modell analysis

- **KORKHAUS ANALYSIS**-This is similar to pont's analysis. According to this, for a given width of upper incisor, a specific value of the distance b/n midpoint of inter premolar line to point in b/n the max. incisor exist.

INFERENCE-Increase in this measurement denotes proclined upper anteriors, while reduced value indicates retroclined upper anteriors.

Ideal upper anterior length:
$$\frac{SI \times 100}{160}$$

The optimal length of the lower arch
is 2 mm shorter than the upper.





S.No.	Sum of Incisors (in Mms)	Arch Width in Premolar region (in Mms)	Arch Width in Molar Region (in Mms)	Perpendicular Distance from Incision to Inter-premolar line (in Mms)
1.	27	32	41.5	16
2.	27.5	32.5	42.3	16.3
3.	28	33	43	16.5
4.	28.5	33.5	43.8	16.8
5.	29	34	44.5	17
6.	29.5	34.7	45.3	17.3
7.	30	35.5	46	17.5
8.	30.5	36	46.8	17.8
9.	31	36.5	47.5	18
10.	31.5	37	48.5	18.3
11.	32	37.5	49	18.5
12.	32.5	38.2	50	18.8
13.	33	39	51	19
14.	33.5	39.5	51.5	19.3
15.	34	40	52.5	19.5
16.	34.5	40.5	53	19.8
17.	35	41.2	54	20
18.	35.5	42	54.5	20.5
19.	36	42.5	55.5	21

Korkhaus Measurements.

Modellanalyse

- **Schmuth – index**

- Based on SI
- premol.: $SI + 8 \text{ mm}$
- mol.: $SI + 8 + 8 \text{ mm}$
- Anterior length of the dental arch $SI / 2$

ASHLEY HOWE'S ANALYSIS



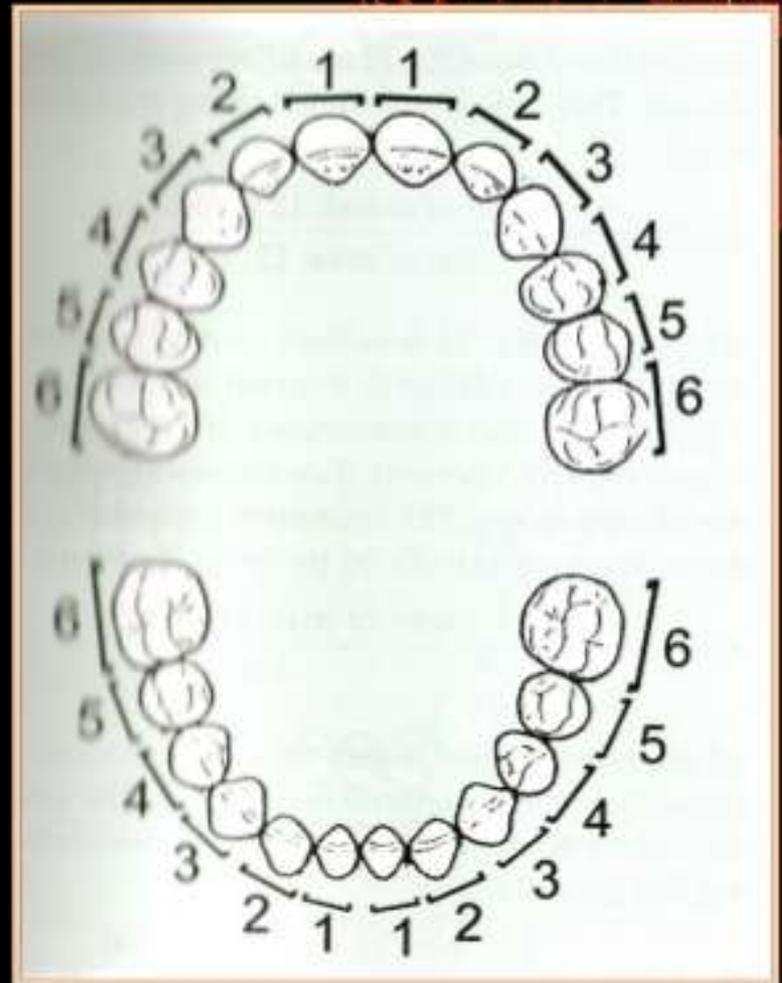
Howe's considered tooth crowding to be due to deficiency in arch width rather than arch length

He found a relationship to exist between the total width of mesiodistal diameter of teeth anterior to the second permanent molar & the width of the dental arch in the first premolar region

PROCEDURE

TTM:- Total Tooth Material

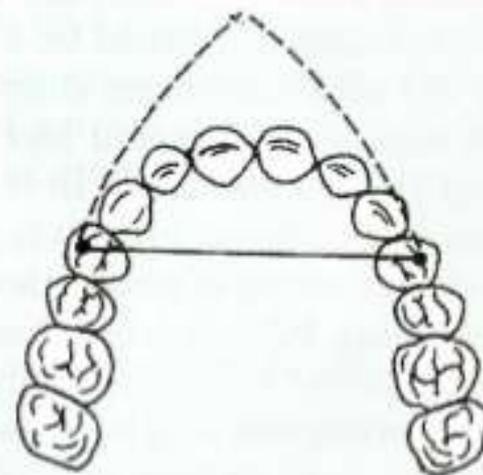
Refers to sum of the mesiodistal width of the teeth from first molar to first molar



PMD:- Premolar Diameter

Coronal base

arch width measured
from the buccal cusp
tips of the **first
premolar** on one side
to the buccal cusp
tip on other side





- Determination of first bicuspid coronal arch width.(**BIC.W**)

This measurement is the distance between the summits of the buccal cusps of the first bicuspids.



PMBAW: - Premolar basal arch Width

Apical base

measured from the root apices of the first premolar on one side to the first premolar on other side





- Determination of **basal arch width(B.A.W)** above the maxillary first bicuspids and below of mandibular first bicuspids.
- Basal arch width will be greater than the coronal arch.



INFERENCES

If $PMBAW > PMD$:-

indication that basal arch is sufficient to allow expansion of premolars

If $PMD > PMBAW$:-

can be three possibilities

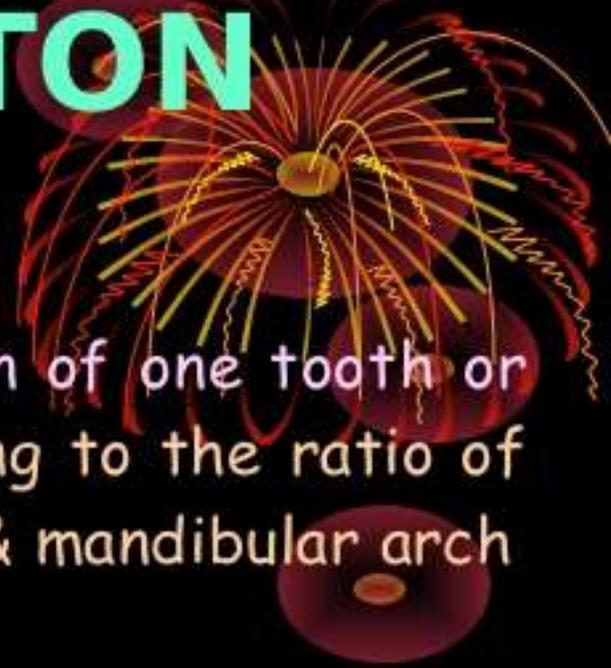
- 1) contraindicated for expansion
- 2) move teeth distally
- 3) extract some teeth

If $PMBAW \times 100 / TTM$

- a) less than 37% \longrightarrow require extraction
- b) if 44% an ideal case \longrightarrow extraction not require
- c) if between 37-44% (border line case) \longrightarrow may or may not require extraction



WAYNE A. BOLTON ANALYSIS



Bolton pointed out that the extraction of one tooth or several teeth should be done according to the ratio of tooth material between the maxillary & mandibular arch

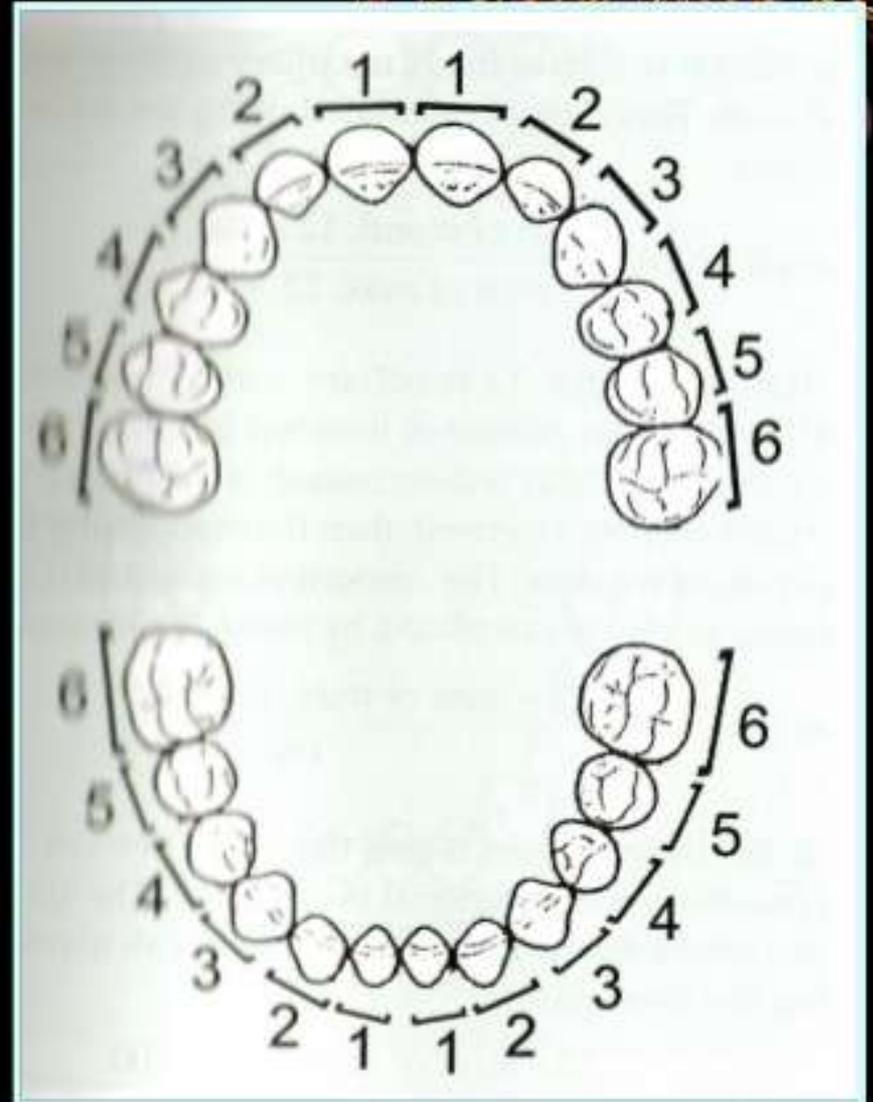
to get ideal interdigitation, overjet, overbite & alignment of teeth

to attain an optimum interarch relationship

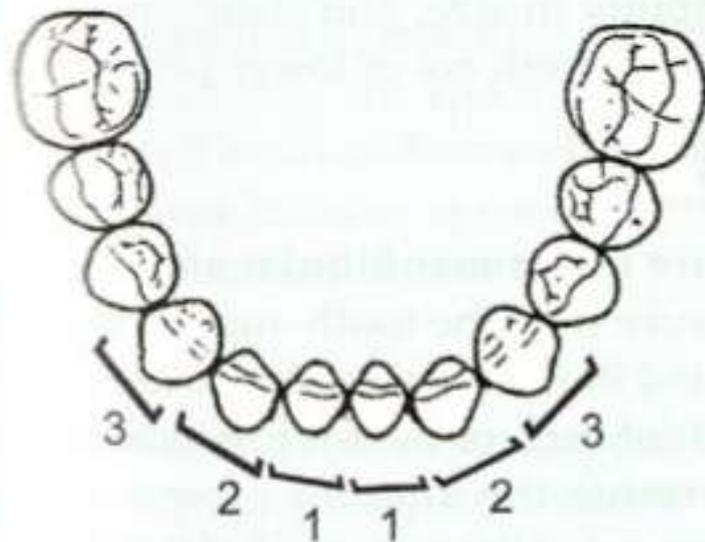
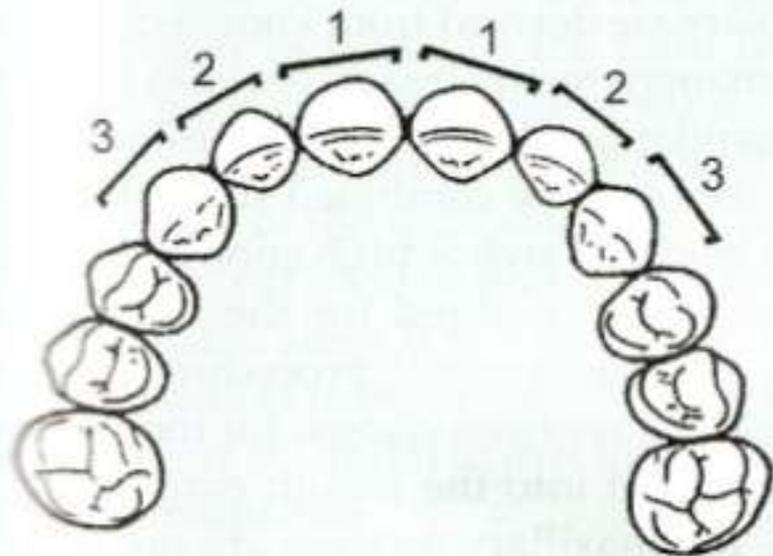
Bolton's analysis helps to determine the disproportion between the size of maxillary & mandibular teeth

PROCEDURE

the sum of mesiodistal diameter of the 12 maxillary teeth & the sum of the mesiodistal diameter of the 12 mandibular teeth are determined



In same manner the sum of 6 maxillary anterior teeth & the sum of 6 mandibular teeth is determined.



OVERALL RATIO:-

sum of mesiodistal width of mandibular 12 teeth X 100

sum of mesiodistal width of maxillary 12 teeth

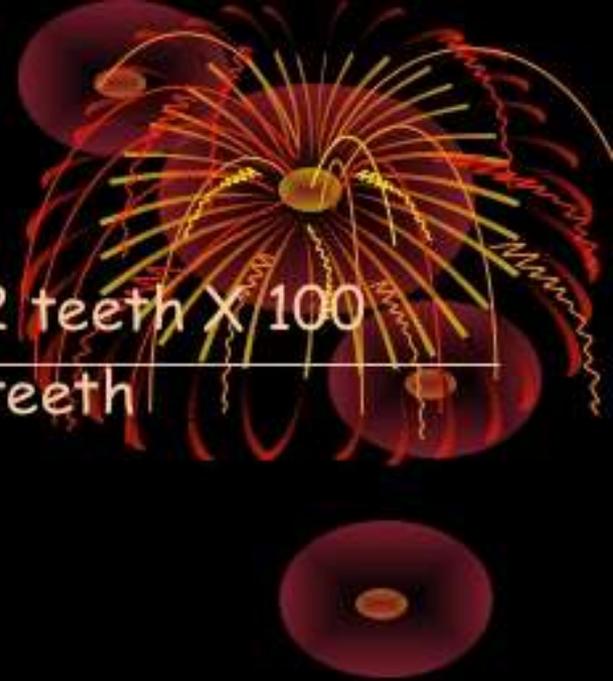
MEAN = 91.3% 89.5%-93,1%, normal range

ANTERIOR RATIO:-

sum of mesiodistal width of mandibular 6 teeth X 100

sum of mesiodistal width of maxillary 6 teeth

MEAN = 77.2% 75.5%-78,9% normal range



INFERENCES:-

- If the ratio is more than mean value, then the mandibular tooth material is excessive
- If the ratio is less than mean value, then the maxillary tooth material is excessive

Bolton prefers to do proximal stripping on the upper arch if the upper anterior tooth material is in excess &

extraction of lower incisor, if necessary, to reduce tooth material in the lower arch



Orthodontic treatment in primary dentition

- **1.Progenia**
- appliance: chin cap
- **2.Bad habits: thumb sucking,**
- appl.: oral screen
- **3.Cleft lip and cleft palate**
- **4.Loss of primary teeth**
- appl.: space maintainer
- **5.Crossbite**
- appl.: inclined plane

Orthodontic treatment in mixed dentition

- 1. Crossbite
 - appl.: inclined plane
- 2. Early loss of primary teeth
 - appl.: space maintener
- 3. Functional jaw orthopedic
 - Sagittal anomalies: Angle II. – distalocclusion
 - Angle III. – mesialocclusion
 - Vertical anomalies: open bite
 - deep bite
 - appl.: bimaxillary functional appliances activator, bionator, Frankel-appl., Hansa-appl. etc.
- 4. Diasthema medianum
 - appl.: removable appliance with springs
 - brackets
- 5. Crowding with or without lateral crossbite
 - appl.: expansion of the dental arch with activ removable plates or quad-helix
- 6. Timing of first molar's extraction
 - (reason: gangrena, periostitis, periodontitis etc.)
- 7. Hotz serial extractio
 - –primary canines
 - –primary first molars

- 1. Treatment with fixed appliances
 - - multiband, multibond
 - - lingual and palatinal arches
 - - Hyrax
- 2. Orthodontic treatment with extraction (most frequently: first premolars)
 - reason: crowding or overjet
- 3. Orthodontic treatment with surgical intervention
 - f.e.: impacted teeth
- 4. Treatment with missing teeth
 - space closure or preprosthetic orthodontic treatment
 - -reason: aplasia, accidents, caries
- 5. Dysgnathia operations (age: 18)
 - progenia, prognathia, open bite
- 6. Orthodontic treatment in periodontal diseases
- 7. **Problems with wisdom teeth**

