1. **Collection of Information**
   1. Medical and Dental History
   2. Extraoral Examination
   3. Functional examination
      (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 compliant should be recorded in his/her own words.

This help 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.
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 ?, complett or incomplett 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, dolicocephalic, brachycephalic
Brachycephalic
Tendency for a deep bite

Dolichocephalic
Tendency for an open bite
- **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**.
**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 I MALOCCLUSION**.
Normocephalic

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

- Sagittal (mesiodistal anomalies-Angle classification)
- Vertical (deep bite, open bite)
- Transversal (narrow)
Angle Class I. = neutral occlusion

Angle classification based on: anteroposterior (sagittal) relationship of the jaws
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)
Distoocclusion
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 distooclusion”
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 forses 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 assimetry
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
1. **Collection of Information**
   1. Medical and Dental History
   2. Extraoral Examination
   3. Functional examination
      (TMJ, orofacial muscles, tongue position, respiration, habits)
   4. Intraoral Examination and Study Models
   5. Radiographs
      - panoramic
      - cephalometric
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 gumpads 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
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.
Mouth 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.
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 = Width of 3, 4, 5

Available place

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<tr>
<th>543</th>
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<th>12</th>
<th>345</th>
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Difference

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</table>

Sum of differences

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

If 1 mm protrusion is possible it means 2 mm place-winning.
If 1 mm retraction is necessary it means 2 mm 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.

www.indiandentalaca
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<th>Total mandibular incisor width</th>
<th>width of 345</th>
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<tr>
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<td>20.9, 20.4</td>
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<tr>
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<td>21.2, 20.7</td>
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<tr>
<td>-----------</td>
<td>------</td>
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</table>

Ábra 5-17 Táblázat a Michigan-analízishez.

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 anterior & 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:

\[
\frac{SI \times 100}{64}
\]
Pont-Index

- If the difference between the optimal premolar, molar distance and the measured premolar, molar distance (on the model) is less than 5 mm EXPANSION

- If the difference between the optimal premolar, molar distance and the measured premolar, molar distance (on the model) is more than 8 mm EXTRACTION

- Between 5-8 mm BORDERLINE CASE
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 between midpoint of inter premolar line to point in between the max. incisor exists.

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

Ideal upper anterior length:

$SI \times 100$

160

The optimal length of the lower arch is 2 mm shorter than the upper.
<table>
<thead>
<tr>
<th>S.No.</th>
<th>Sum of Incisors (in Mms)</th>
<th>Arch Width in Premolar region (in Mms)</th>
<th>Arch Width in Molar Region (in Mms)</th>
<th>Perpendicular Distance from Incision to Inter-premolar line (in Mms)</th>
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</table>
Modellanalyse

- Schmuth – index

- Based on SI
- premol.: SI + 8 mm
- mol.: SI + 8 + 8 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 the 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 ach Width

Apical base measured from the root apices of the first premolar on one side to the first premolar on other side
Determinaton 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 X100 / TTM
a) less than 37% → require extraction
b) if 44% an ideal case → extraction not require
c) if between 37-44% (border line case) → may or may not require extraction
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 interdigation, 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:
\[
\frac{\text{sum of mesiodistal width of mandibular 12 teeth}}{\text{sum of mesiodistal width of maxillary 12 teeth}} \times 100
\]
\[
\text{MEAN} = 91.3\% \\
89.5\%-93.1\%, \text{ normal range}
\]

ANTERIOR RATIO:
\[
\frac{\text{sum of mesiodistal width of mandibular 6 teeth}}{\text{sum of mesiodistal width of maxillary 6 teeth}} \times 100
\]
\[
\text{MEAN} = 77.2\% \\
75.5\%-78.9\% \text{ normal range}
\]
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 maintenier

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
   – permanent first premolars
- 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