Ortho.Lec.1 2023 5th class Lecturer Zainab Bahgat

ORTHODONTIC DIAGNOSIS

- The primary task for the clinician is to identify the problem and find its etiology .
- Once this is done , and only then can a treatment plane be formulated.

Diagnosis involve the development of a comprehensive and concise data base of information ,sufficient to understand the patient problem as well as answer question arising in the treating clinician mind.

Orthodontic diagnosis :-

- deals with recognition of the various characteristics of the malocclusion and dentofacial deformity.
- should be based on scientific knowledge combined at times with clinical experience and common sense.
- design a treatment strategy based on the specific needs and desires of the individual;
- present the treatment strategy to the patient in such a way that the patient fully understands his/her decision.

The data base is derived from diagnostic aids

They are of two types –

a. ***Essential diagnostic aids*** -
   i. *Case history*
   ii. *Clinical examination*
   iii. *Study models*
   iv. *Certain radiographs –*
      Panoramic radiograph
   v. *Facial photographs*

b. ***Supplemental diagnostic aids*** –
   i. *Specialized radiographs*
   ii. *Electro myographic examination of muscle activity*
   iii. *Hand – wrist radiograph*
   iv. *Endocrine tests*

- **CASE HISTORY:-**

- **Personal details** –

NAME –

Communication

Identification

Psychological benefits

It makes the patients more comfortable when he is addressed by his first name and arouses a feeling of familiarity, which has a positive psychological effect on the patient

Age and Date of Birth –

The chronologic age of the patient helps in:-

- Diagnosis and treatment planning
- Growth modification procedures
- Surgical resective procedures

The age of the patient also dictates the use of certain treatment protocols-for example, surgical correction might be advocated following cessation of growth whereas the same malocclusion might be treated using functional appliances if the patient has a potential to grow.

- **. SEX** – Treatment planning

e. g. the timing of growth events such as growth spurts are different in males and females, Females precede males in onset of growth spurts, puberty and termination of growth

- . **Address and occupation –**

Evaluation of socio – economic status

In selection of an appropriate appliance

- **Race :** negroid race usually obtain an anterior diversion of the face with bimaxillary alveolodental protrusion
- **Referred by :** can give us a good impression about the patient co-operation
  - **CHIEF COMPLAINT The patient's chief complaint should be recorded in his/her own words.**

▶ **This helps the clinician in identifying the priorities and desires of the patient.**

▶ **There are three major reasons for patient concern about the alignment and occlusion of the teeth:**

- impaired dento-facial esthetics that can lead to psychosocial problems,

- &a desire to enhance dento-facial esthetics and thereby the quality of life.

- impaired function,

- **MEDICAL HISTORY :-**

In obtaining the medical history, the orthodontist or assistant must always ask a few important questions, as

the last time a physician was seen, any hospitalizations,

It is important to discuss any medications the patient may be taking, since some may have an effect on orthodontic treatment. Some examples of conditions and medications that impact orthodontic treatment include uncontrolled diabetes, which can exacerbate periodontal breakdown in response to orthodontic forces, and bisphosphonates, which can result in very slow orthodontic tooth movement.

Similarly, chronic use of high-dose prostaglandin inhibitors for management of arthritis in adults may interfere with orthodontic tooth movement.1 Extractions may be contraindicated in patients with hemophilia, while patients with attention deficit hyperactivity disorder (ADHD) may have less than ideal compliance. In addition, latex or nickel sensitivity allergic patients must be identified and appropriate measures taken to avoid any incidents.

information regarding allergies, especially latex or nickel sensitivity;

history of blood transfusions; and heart problems such as mitral valve prolapse or rheumatic fever .

- **DENTAL HISTORY :-**

The dental history of the patient should include ,

age of eruption of the deciduous and permanent teeth,

history of extraction, decay, restorations and

history of trauma to the dentition.

- **PRENATAL HISTORY**-

it include information on the condition of the mother during pregnancy and the type of delivery.

▶ Forceps delivery predispose to TMJ injuries that can result mandibular growth retardation

▶ The use of drugs , or even excess use of certain vitamins or affectation with some infection during pregnancy like german measles can results in congenital deformities of child.

POST NATAL HISTORY -it includes information on the type of feeding, presence of habits especially digit sucking and tongue thrust.

FAMILY HISTORY- class II,classIII malocclusions and congenital conditions such as clefts of lip & palate are inherited.

Family history should record details of mal-occlusion existing in other members of the family.

GENERAL EXAMIATION

- Height and weight-they provide clue to the physical growth and maturation of the patient.
- Gait-(way a person walks) abnormalities of gait are usually associated with neuromuscular disorders that may have a dental correlation.
- Posture-(way a person stands)abnormal postures can predispose to malocclusion due to alteration in maxillo-mandibular relationship.

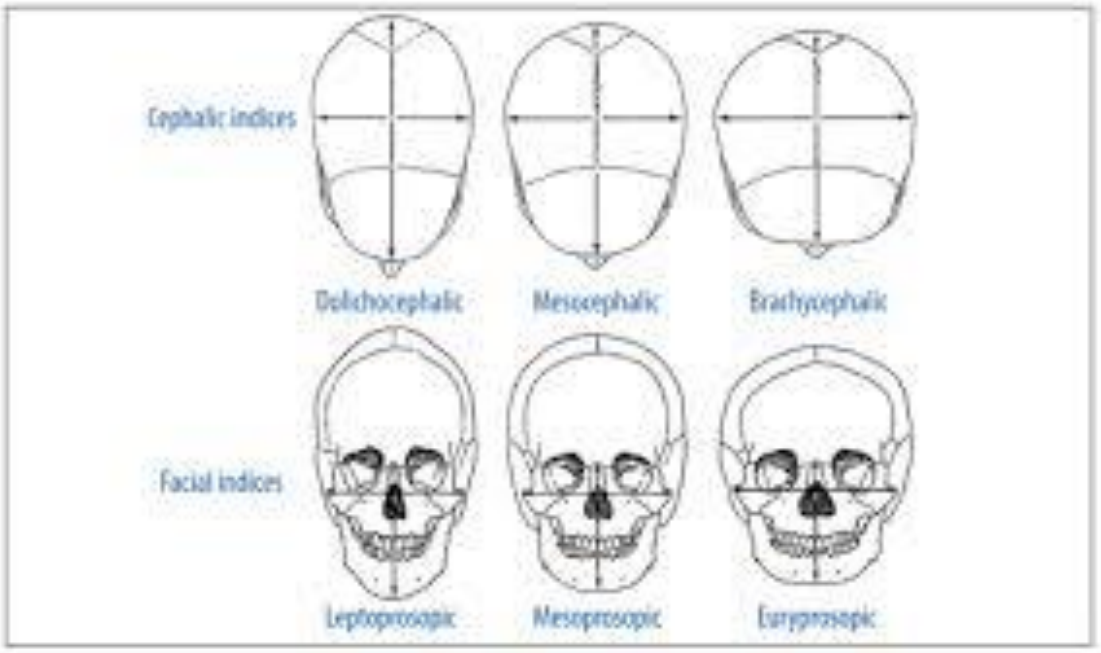
SHELDEON CLASSIFICATION OF BODY BUILD

- A)ECTOMORPHIC- tall and thin physique
- B) MESOMORPHIC- average physique
- C)ENDOMORPHIC- short and obese physique

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



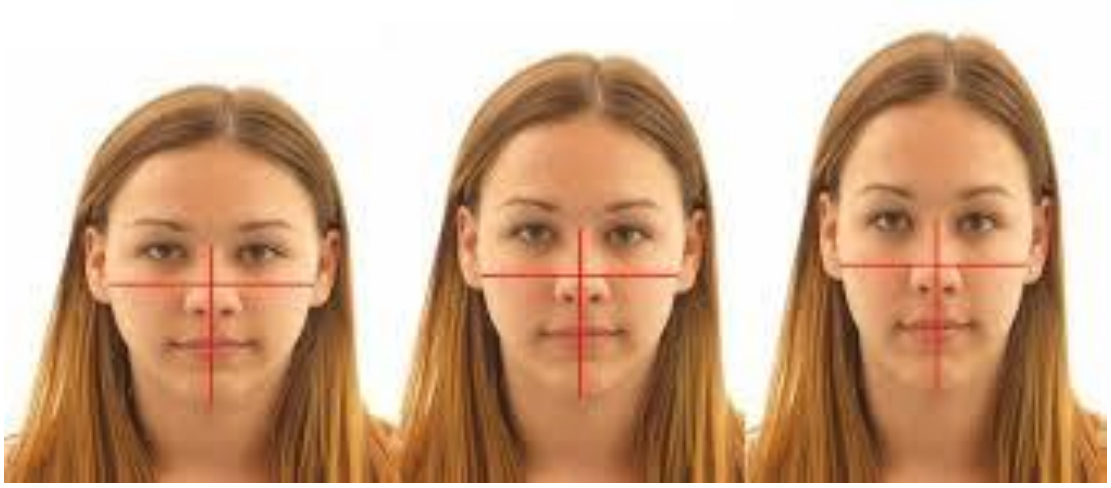
FACIAL FORM

- A)MESOPROSOPIC-average or normal face form
- B)EURYPROSOPIC-face is broad and short
- C)LEPTOPROSOPIC-long and narrow face form

Facial index

- The shape of the face is assessed by the morphologic facial index which was given by Martin and Saller (1957) as:

$$I = \frac{\text{Morphologic facial height (distance between nasion and gnathion)}}{\text{Bizygomatic width (distance between the zygoma points)}}$$



The type of facial morphology has a certain relationship to the shape of the dental arch, e.g. :- euryprosopic face types have broad, square arches; border line crowding in such cases should be treated by expansion.

- On the other hand, leptoprosopic face types often have narrow apical basel arches. Therefore, extraction is preferred over expansion.

FACIAL SYMMETRY

- The patient's facial symmetry is examined to determine disproportions of the face in transverse and vertical planes. Gross facial asymmetry can occur as a result of:
- A. congenital defects
- B.hemi-facial atrophy/hypertrophy
- C.unilateral condylar ankylosis and
- D.unilatera hyperplasia

The role of fifth

Facial proportions and symmetry in the frontal plane. An ideally proportional face can be divided into central , medial ,and lateral equal fifths. The separation of the eyes and the width of the eyes, which should be equal ,determine the central and medial fifths. The nose and chin should be cantered within the central fifth, with the width of the nose the same as or slightly wider than the central fifth. The inter – pupillary distance (dotted lines) should equal the width of the mouth

Vertical facial proportions in the frontal and lateral views are best evaluated in the context of the facial thirds, which are equal in height in well-proportioned faces. In modern Caucasians, the lower facial third often is slightly longer than the central third. The lower third has thirds : the mouth should be one-third of the way between the base of the nose and the chin.

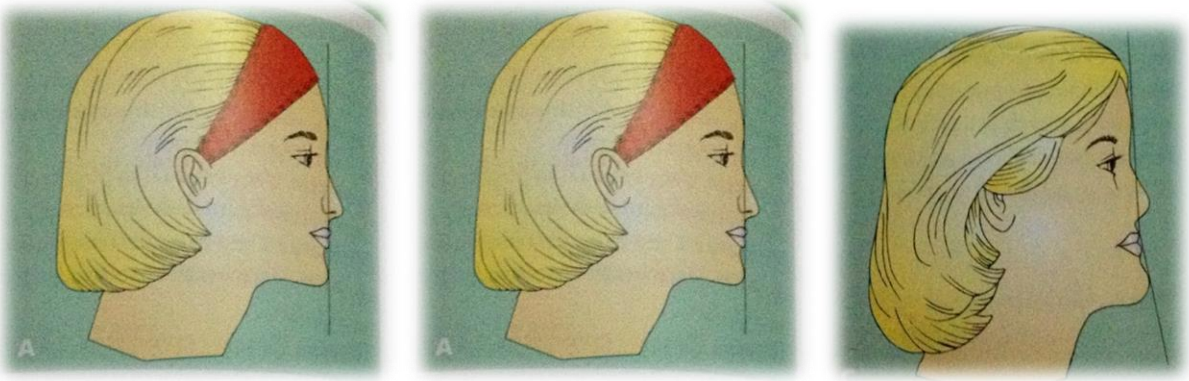
FACIAL PROFILE

- **The facial profile is examined by viewing the patient from the side. the facial profile helps in diagnosing the gross deviation of maxillo-mandibular relationship. the profile is assessed by joining the <u>following two reference lines:-</u>**

1. **A line joining the forehead and the soft tissue point A(deepest point in curvature of upper lip)**

2. **A line joining point A and the soft tissue pogonion(most anterior part of the chin)**

- **STRAIGHT / orthognathic 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 II div 1 patients)**
- **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 Ill patients)**



FACIAL DIVERGENCE

Facial divergence is defined as anterior or posterior inclination of the lower face relative to the forehead.

- **ANTERIOR DIVERGENT-a line drawn between the forehead and the chin is inclined anteriorly towards the chin..**

POSTERIOR DIVERGENT

- **A line drawn between the forehead and chin slants posteriorly towards chin.**

STRAIGHT/ORTHOGNATHIC

- **The line between the forehead and the chin is straight or perpendicular to the floor.**
- **The facial divergence is to a large extend influenced by patient's ethnic and racial background.**

ASSESSMENT OF ANTERO-POSTERIOR JAW RELATIONSHIP

- **It can be assessed clinically.**
- **Ideally maxillary skeletal base is 2-3 mm ahead of the mandibular skeletal base when the teeth are in occlusion.**
- **Estimation is done by placement of index and middle fingers at the soft tissue point A and point B respectively.**

- **In skeletal CLASS II PATIENTS, the index finger is anterior to middle finger or the hand points upwards.**
- **In a skeletal CLASS III patient, the middle finger is ahead of the forefinger or the hand points downwards.**
- **In a patient with CLASS I skeletal pattern the hand is at an even level.**

ASSESSMENT OF VERTICAL SKELETAL RELATIONSHIP

- **The vertical skeletal relationship assessed by studying the angle formed between the lower border of the mandible and the Frankfort horizontal plane (a line between the most superior point of external auditory meatus and inferior border of orbit)**
- **Normally the two planes intersects near the occipital region.**
- **In case the two planes meets beyond the occipital region, it indicates a low angle case or a horizontal growing face.**
- **If two planes meet anterior to occipital region it indicates a high angle case or a vertical growing face.**
- **A normal vertical relationship is one where the distance between the glabella and subnasale is equal to the distance from the subnasale to the under side of the chin.**
- **Reduced lower facial height is associated with deep bites while increased lower facial height is seen in anterior open bites.**

Examination of the Soft Tissues

- **Extraoral**

1. Forehead **For a face to be harmonious, the height of the forehead (distance from hairline to glabella) should be as long as the mid-third**

(glabella-to-subnasale) and the lower third (subnasale-to-menton), i.e. each of these is one-third the total face height

2. Nose Size, shape and position of the nose determines the esthetic appearance of the face

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.**

CLASSIFICATION OF LIPS

- **COMPETENT LIP-THE LIPS ARE IN SLIGHT CONTACT WHEN MUSCULATURE IS RELAXED.**
- **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.**
- **POTENTIALLY INCOMPETENT LIP-they are normal lips that fails to form a lip seal due to proclained upper incisor.**

EVERTED LIP-they are hypertrophied lips with weak muscular tonicity.

EXAMINATION OF CHIN

- **MENTOLABIAL SULCUS-concavity seen below the lower lip. Deep mentolabial sulcus is seen in CLASS11,DIVISON 1 malocclusion.**

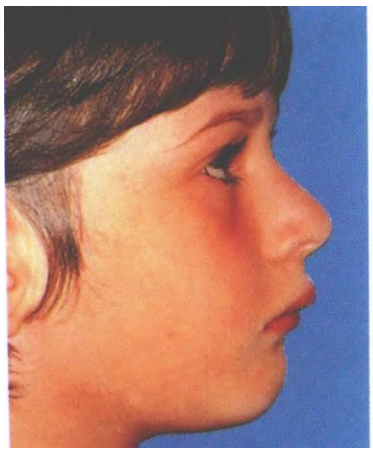
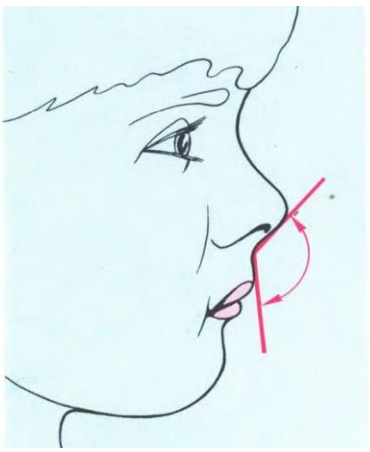
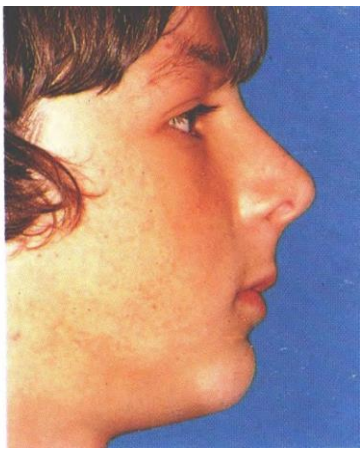
- **CHIN POSITION AND PROMINENCE-prominent chin is usually associated with class 111 malocclusion.**
  - **NASOLABIAL ANGLE :-**

This is the angle formed between a tangent to the lower

border of the nose and a line joining the subnasale with

the tip of the upper lip (labrale superius)

- **This angle is normally 100◦-110◦ .**
- **It reduces in patients having proclined upper anteriors or prognathic maxilla.**
- **It increases in patients with retrognathic maxilla or retroclined maxillary anteriors.**

Refrences

-An Introduction to Orthodontic.fourth edition 2013 United Kingdom--Laura Mitchell, MBE Oxford

-CONTEMPORARY ORTHODONTICS , FifTH EDITION 2013--WILLIAM R. PROFFIT, MOSBY

--Textbook of Orthodontics Second Edition: 2007--Gurkeerat Singh, Jaypee New Delhi 110 002, India

--ORTHODONTIC REVIEW, SECOND EDITION 2015--Jeryl D. Sercan Akyalcin -Timo Peltomäki -Kate Litschel, by Mosby, an imprint of Elsevier Inc

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INTRA-ORAL EXAMINATION

- **EXAMINATION OF TONGUE :-**

- Abnormalities of the tongue can upset the muscle balance and equilibrium leading to malocclusion.
- Presence of excessively large tongue is indicated by scalloping on the lateral margins of the tongue.
- The lingual frenum should be examined for tongue –tie as it alters the resting tongue position and impairs the tongue movement.

▶ Examination of the palate :- The palate should be examined for the following findings :

- Variation in palatal depth
- Presence of swelling
- Presence of clefts

- **EXAMINATION OF GINGIVA** :-

- The gingiva should be examined for inflammation, recession and other mucogingival lesions.
- Presence of poor oral hygiene is usually associated with generalized marginal gingivitis.
- Anterior marginal gingivitis can be seen in mouth breathers due to dryness of the mouth .
- Bleeding on probing may indicates active disease, which must be brought under control before treatment is undertaken.

- **EXAMINATION OF FRENAL ATTACHMENTS :-**

- A heavy maxillary labial frenum may be cause of a midline diastema.
- Abnormal frenal attachments are diagnosed by a blanch test where the upper lip is stretched upwards and outwards for a period of time.

Occlusion: ***Is the way the maxillary & mandibular teeth articulate.***

Is defined as "every contact of teeth of the maxilla with those of the mandible“

Types

-Ideal occlusion.

-Normal occlusion.

–Malocclusion.

Ideal Occlusion ***is a hypothetical concept based on the anatomy of the teeth .it provide a standard by which all other occlusion may be judged.***

Normal occlusion ***occurs frequently in a population, whereas ideal occlusion is a rarity. Normal occlusion includes variations in tooth positions and relationships that diverge in minor ways from the ideal***

Normal permanent occlusion Static occlusal relations (Andrews' six keys)

•1- Molar relationship. Distal surface of the distal marginal ridge of upper 6 contacts and occludes with the mesial surface of the mesial marginal ridge of lower 7;the mesiobuccal cusp of upper 6 lies in the groove between the mesial and middle cusps of lower 6;the mesiolingual cusp of upper 6 seats in the central fossa of lower6

• 2-Crown angulation. Gingival aspect of the long axis of each crown lies distal to its occlusal aspect.

•3- Crown inclination. The gingival aspect of the labial surface of the crown of 12I12 li es palatal to the incisal aspect. Otherwise, the gingival aspect of the labial or buccal surface of the crowns of all other teeth lies labial or buccal to the i ncisal/occlusal aspect.

• 4-No rotations.

•5- No spaces

•6- Flat or mildly increased (<_1.5mm) curve of Spee.

Functional occlusal relations

- ***Centric relation should coincide with centric occlusion.***
- ***A working side canine rise or group function should be present on lateral excursions, with no occlusal contact on the non-working side; the incisors should only contact in protrusion.***

Neutrocclusion is a maximum intercuspidation of maxillary and mandibular teeth with minimal overbite and overjet.

Malocclusion

Is an irregularity in the occlusion beyond the accepted range of normal

Malocclusion may be associated with one or more of the following

- **Malocclusion of individual teeth**
- **Malrelationship of the dental arches in any plane of space (sagittal ,vertical ,transverse)**

Malocclusion of individual teeth

1. **Tipped:The tooth apex is normally placed but the crown incorrectly positioned. Teeth may be tipped laterally (termed angulation) or may be tipped labiopalatally (termed 'inclination)**
2. **Displaced, Both apex and crown are incorrectly positioned.**
3. **Rotated: The tooth is rotated around its long axis.**
4. **In infra-occlusion. The tooth has not reached the occlusal level**
5. **insupra-occlusion. The tooth has erupted past the occlusl level**
6. **Transposed. Two teeth have reversed their positions. example of this might be an upper canine and first premolar**

Teeth that are tilted or displaced are described according to the direction of the malposition; for example, an incisor may labially inclined (or proclined), lingually inclined (or retroclined) . mesially angulated, or distally angulated. Similar terms rnay be applied to displacements. Rotations are probably best described by the approximal surface that is furthest from the line of thc arch and the direction it faces; for example, a rotated upper incisor is described as mesiolabially rotated if the mesial aspect is out of the line of the arch while a similar rotation would be describcd c. distopalatal if the distal aspect was palatally positioned.

- **Malrelationship of the dental arches (sagittal)**

CL II malocclusion can be divided into:

1- Dental CL-II malocclusions.

2- Skeletal CL-II malocclusions.

Skeletal CL-II Malocclusion: can be subdivided;

1- CL II malocclusions; caused by mandibular deficiency, the mandible is retrognathic and maxilla orthognathic.

2- CL II malocclusions; caused by maxillary excess, the maxilla is prognathic and the mandible orthognathic.

3- CL II malocclusion; caused by combination of mandibular deficiency and maxillary excess.

***"Divisions"* are used in class II malocclusion based on the inclination of the maxillary incisors:**

***Division 1* A class II malocclusion with proclined maxillary incisors, resulting in an increased overjet .**

Division 2 **A class II malocclusion typically with the maxillary central incisors tipped palatally .**

- **Three types of class II division 2**

Type *A*: The four maxillary permanent incisors are tipped palatally, without the occurrence of crowding.

***Type B*: The maxillary central incisors are tipped palatally and the maxillary laterals are tipped labially.**

***Type C*: The four maxillary permanent incisors are tipped palatally with the canines labially positioned.**

- **Class III malocclusion**

1-True Class III malocclusion 2-Pseudo Class III malocclusion

True Class III malocclusion

1-Skeletal Class III malocclusion 2-Dental Class III malocclusion

- ***Skeletal Class III malocclusion***

1-Maxillary retrognathism 2-Mandibular prognathism 3-Combination of both

- ***Dental Class III malocclusion***

1-Mandibular dental protrusion.

2-Maxillary dental retrusion.

3-Combination of both

Assessment of the dentition :- The dentition is examined and the following details are recorded :

- Status of dentition i.e. erupted and missing teeth.

Presence of caries, restorations, malformations, hypoplasia, wear and discoloration.

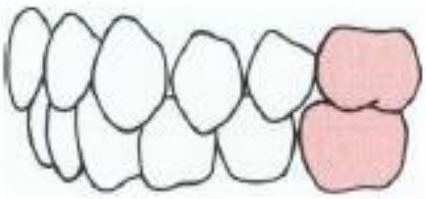
- **Antero – posterior relation** :

- ***Angle's classification***

Angle's classification was based upon the premise that the first permanent molars erupted into a constant position within the facial skeleton, which could be used to assess the anteroposterior relationship of the arches. In addition to the fact that Angle's classification was based upon an incorrect assumption, the problems experienced in categorizing cases with forward drift or loss of the first permanent molars have resulted in this particular approach being superseded by other classifications. However, Angle's classification is still used to describe molar relationship, and the terms used to describe incisor relationship have been adapted into incisor classification.

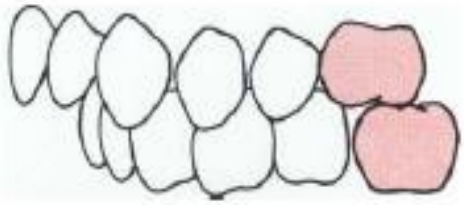
Angle described three groups

- **Class I or neutrocclusion — the mesiobuccal cusp of the upper first molar occludes with the mesiobuccal groove of the lower first molar. In practice discrepancies of up to half a cusp width either way were also included in this category.**
- **Class II or distocclusion — the mesiobuccal cusp of the lower first molar occludes distal to the Class I position. This is also known as a postnormal relationship.**
- **Class III or mesiocclusion — the mesiobuccal cusp of the lower first molar occludes mesial to the Class I position. This is also known as a prenormal relationship.**

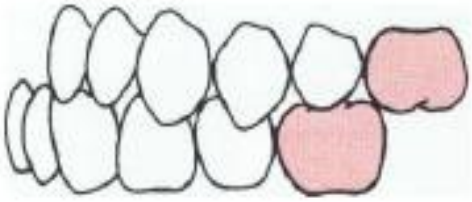


Normal Occlusion

Class I Malocclusion



Class II Malocclusion



Class III Malocclusion

- ***<u>British Standards Institute classification</u>***

This is based upon incisor relationship and is the most widely used descriptive classification. The terms used are similar to those of Angle's classification, which can be a little confusing as no regard is taken of molar relationship. The categories defined by British Standard 4492 are as follows:

- **Class I — the lower incisor edges occlude with or lie immediately below the cingulum plateau of the upper central incisors**
- **Class II — the lower incisor edges lie posterior to the cingulum plateau of the upper incisors. There are two subdivisions of this category:**
    - **Division 1 — the upper central incisors are proclined or of average inclination and there is an increase in overjet**
    - **Division 2 — The upper central incisors are retroclined. The overjet is usually minimal or may be increased**
    - **Class III — The lower incisor edges lie anterior to the cingulum plateau of the upper incisors. The overjet is reduced or reverse**

- ***CANINE CLASSIFICATION***

CLASS I :- **mesial incline of the upper canine overlaps the distal slope of the lower canine.**

CLASS II:- **Distal slope of the max.canine occludes or contact the mesial slope of the lower canine.**

CLASS III:- **The lower canine is displaced anterior to the upper canine with no overlapping of the upper & lower canine.**

Overjet **is the horizontal distance parallel to the occlusal plane from the midpoint of the labial surface on the most anterior lower central incisor to the midpoint of the labial surface on the most anterior upper central incisor. Overjet is positive when the upper incisor is anterior to the lower incisor, zero when the upper incisor is directly above the lower incisor, and negative when the lower incisor is anterior to the upper incisor.**

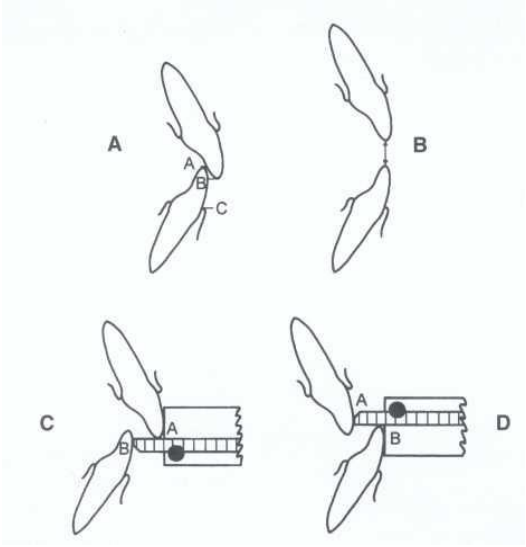
Overbite **Overbite is the amount of vertical overlap between the maxillary and mandibular central incisors(2-4mm). This relationship can be described either in millimeters or more often as a percentage of how much the upper central incisors overlap the crowns of the lower incisors.**

When the incisal edges of the incisors are at the same level, the condition is described as "edge to edge or zero overbite." When there is a lack of overlap, the condition is described as open bite and quantified in millimeters

Ideally, **the lower incisors contact the middle third of the palatal surface of the upper incisors in occlusion.**

Types**: normal, deep or excessive overbite, traumatic, incomplete overbite (no incisal contact), or anterior open bite (lower incisal edge below the level of the upper incisal edge in occlusion)**

- Transverse malrelations, like cross bite and shift of midline



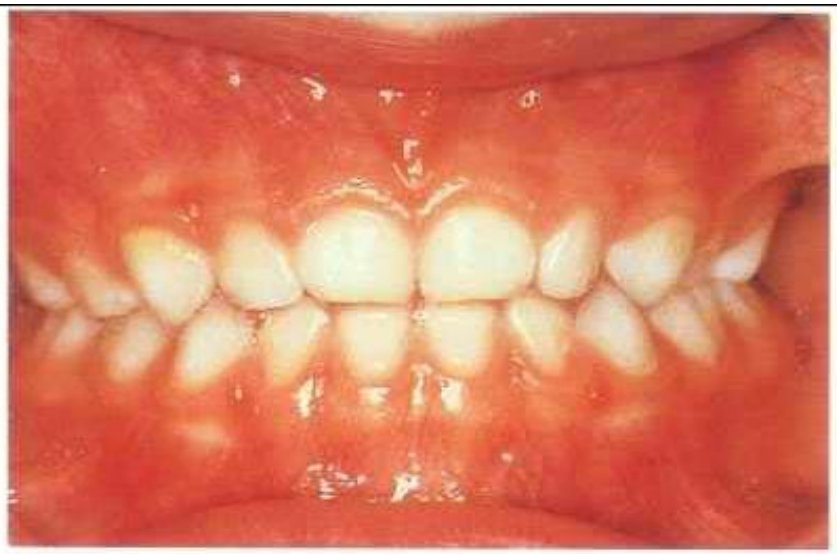


Fig. 1 Unspaced primary dentition.

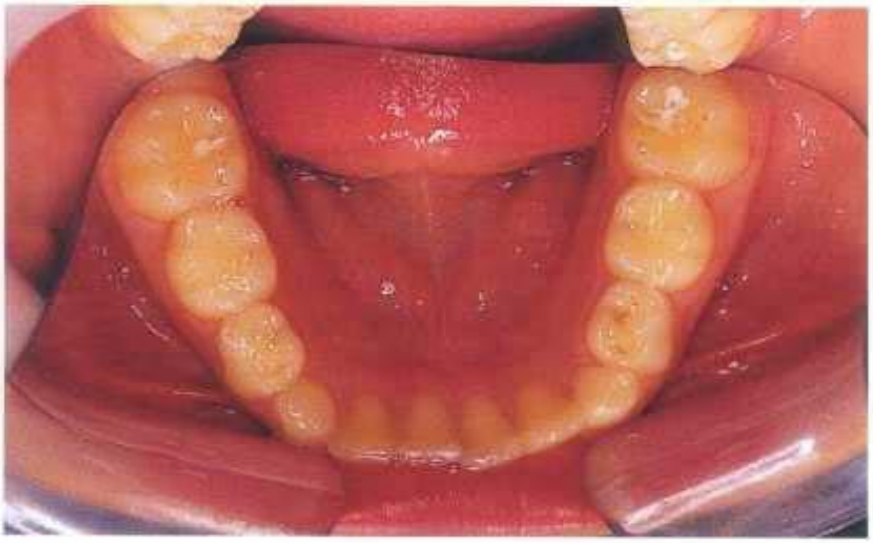


Fig. 2 Mild incisor crowding (aged 8).

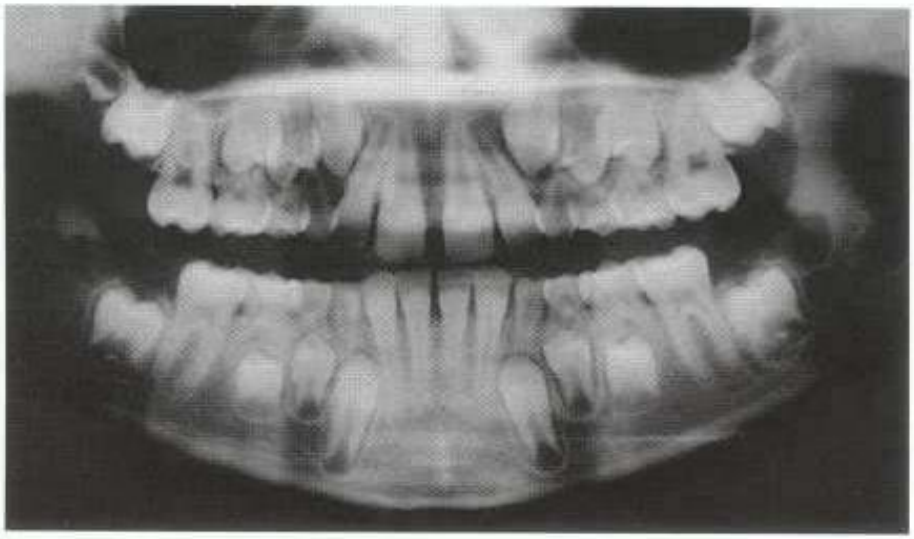
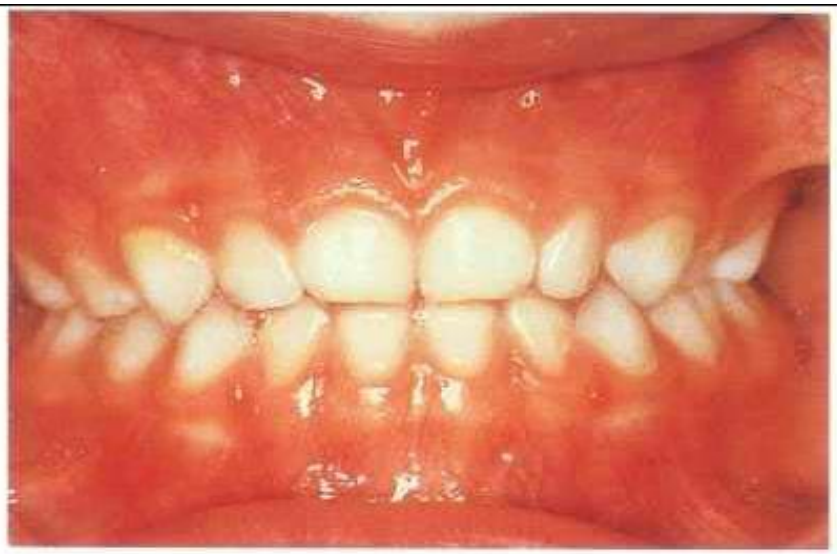


Fig. 3 'Ugly duckling' stage.



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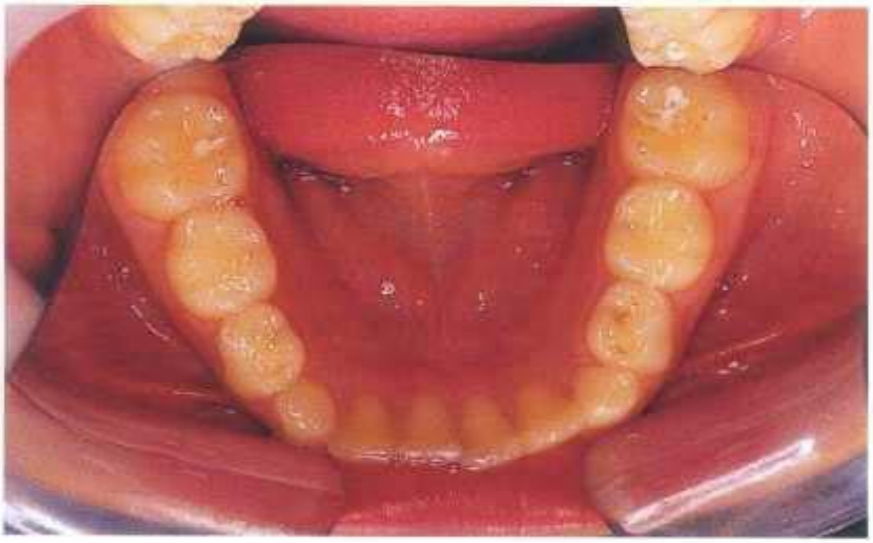

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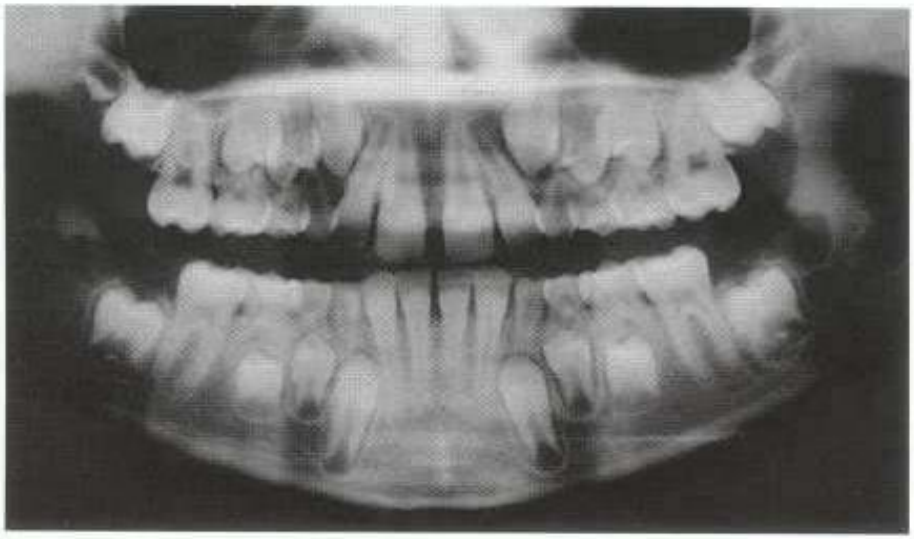


Fig. 3 'Ugly duckling' stage.

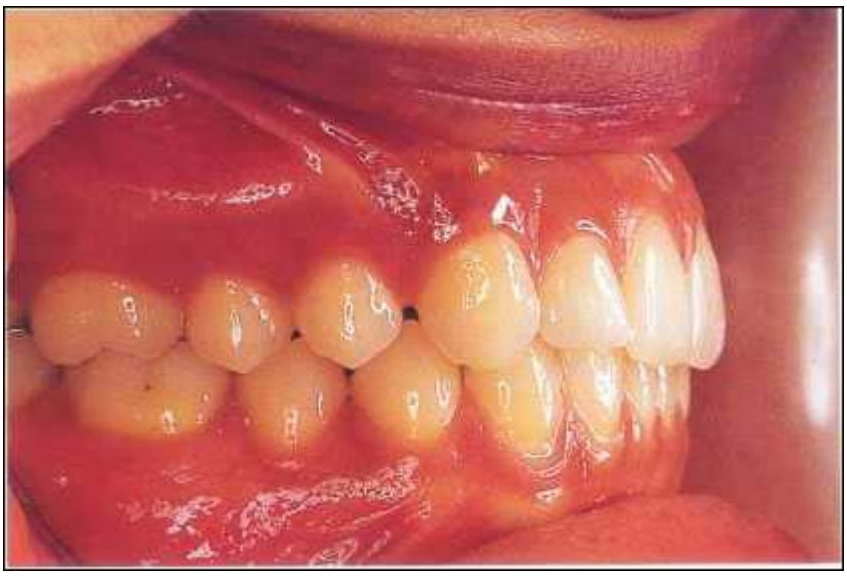
 0

Fig. 4 Normal molar relationship.

Fig. 5Canine guided right lateral xcursion; note that no nonworking side contacts were present.

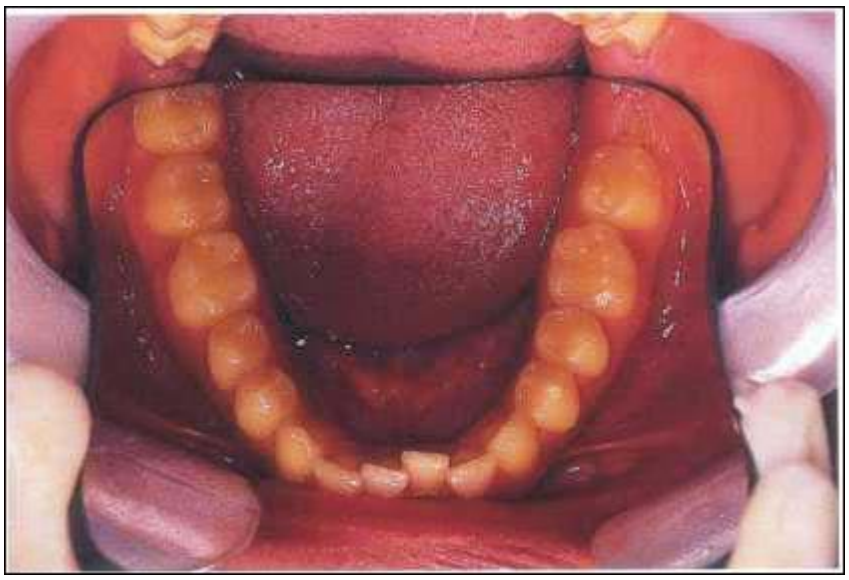


Fig. 6 Late lower incisor crowding.

Fig. 7 Class I molar and incisor relationships with central diastma and buccul crowding .

Fig. 8 Class II molar ll Dlvlsion 1 incisor relatior ! ,

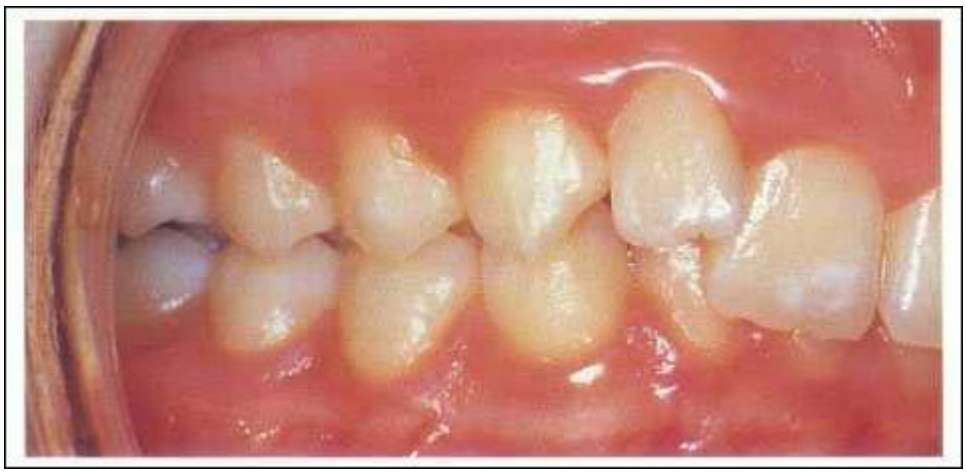


Fig. 9 Half unit Class II molar/II Division 2 incisor relationship.

Fig. 10 Class III molar and incisor relationships.

- Individual tooth irregularities such as rotations, displacements, intrusion and extrusion
- Arch form and symmetry.

WHAT IS OCCLUSION ?

Occlusion

- **“ Occlusion is the relationship of the maxillary and mandibular teeth when the jaws are in fully closed position**.
- The term occlusion has both static and dynamic aspects. Static refers to the form, alignment and articulation of teeth within and between dental arches and the relationship of teeth to their supporting structures. Dynamic refers to the function of the stomatognathic system as a whole comprising teeth, supporting structures, temporomandibular joint, and neuromuscular and nutritive systems.

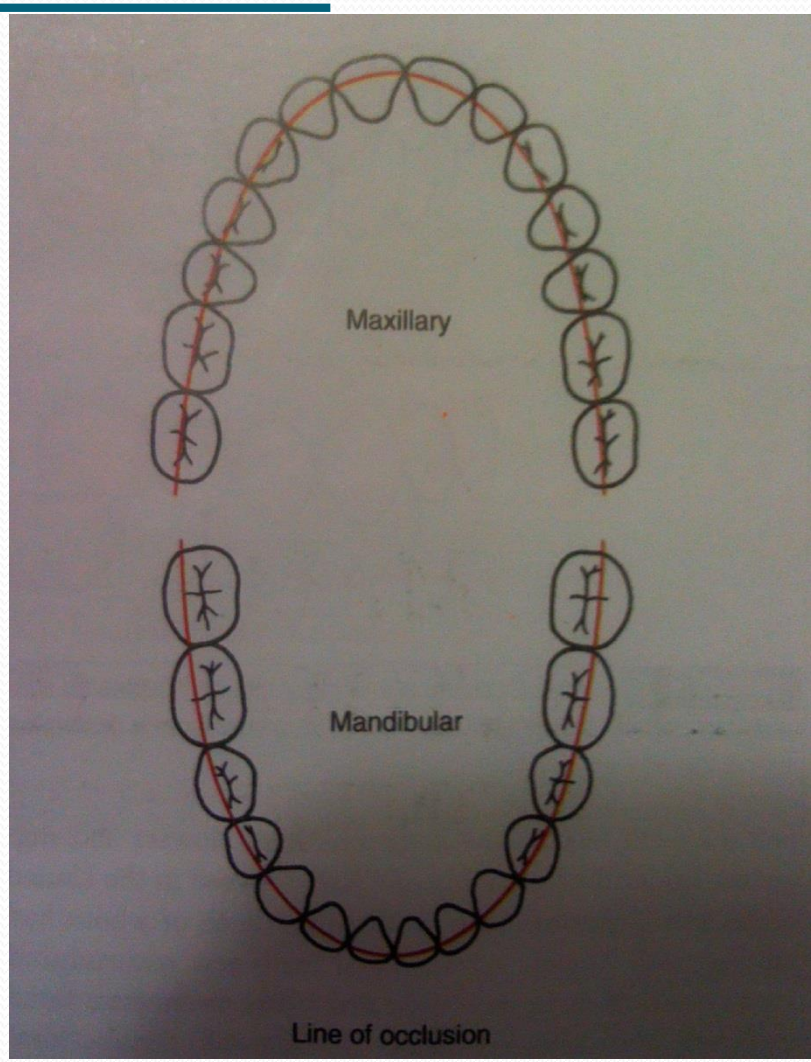
- **Ideal occlusion:** Is the harmonious static and dynamic relationship of teeth and jaws that dentists would like to reproduce when restoring a patient's entire mouth to good form and function.
- **Normal occlusion:** Is an absence of large or many facets, bone loss, closed vertical dimension, bruxing habit, freedom from joint pain, and crooked and loose teeth.
- **Centric Occlusion:** It is the maximum intercuspation or contact attained between maxillary and mandibular posterior teeth.
- **Centric Relation:** Centric relation is the most posterior position of the mandible relative to the maxilla at a given vertical dimension.

- **Centric Relation Occlusion:** Centric relation occlusion (when centric relation and centric occlusion coincide) is the simultaneous even contact between maxillary and mandibular teeth into maximum interdigitation with the mandible in centric relation (most retruded position).
- **Therapeutic Occlusion**: It is an occlusion that has been modified by appropriate therapeutic modalities in order to change a nonphysiological occlusion to one that is at least physiologic, if not ideal.
- **Traumatic Occlusion:** Traumatic occlusion is an abnormal occlusal stress, which is capable of producing or has produced an injury to the periodontium.

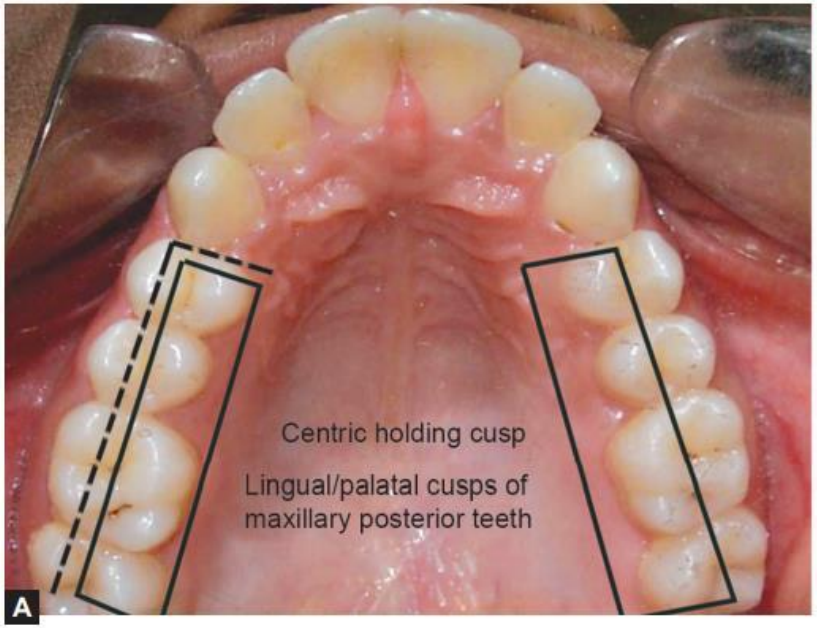
LINE OF OCCLUSION

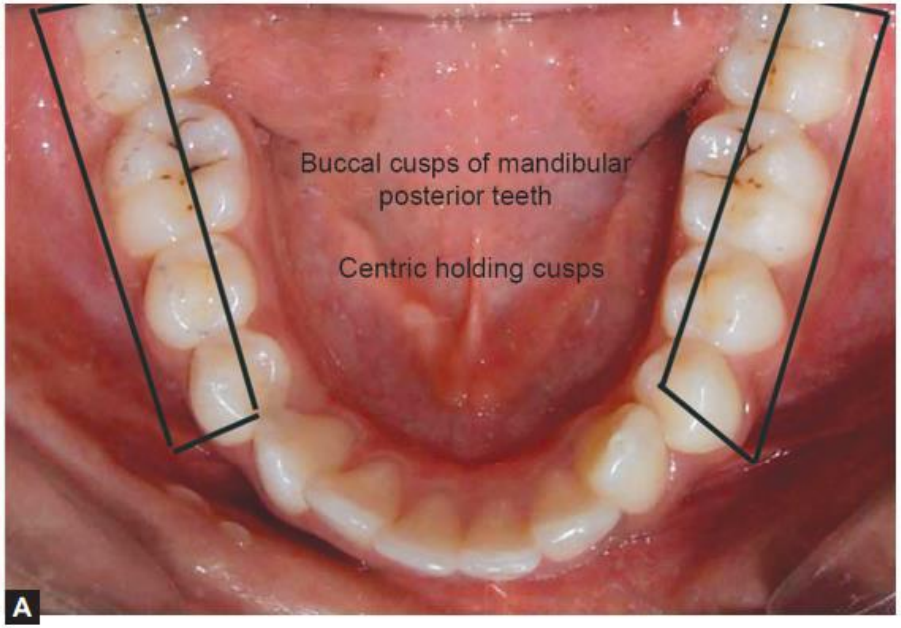
- FOR UPPER ARCH :
  - Smooth curve passing through the central fossa of each upper molar and across the cingulum of upper canine and incisor teeth.

- FOR LOWER ARCH:
  - The same line runs along the buccal cusp and incisal edges of lower teeth.

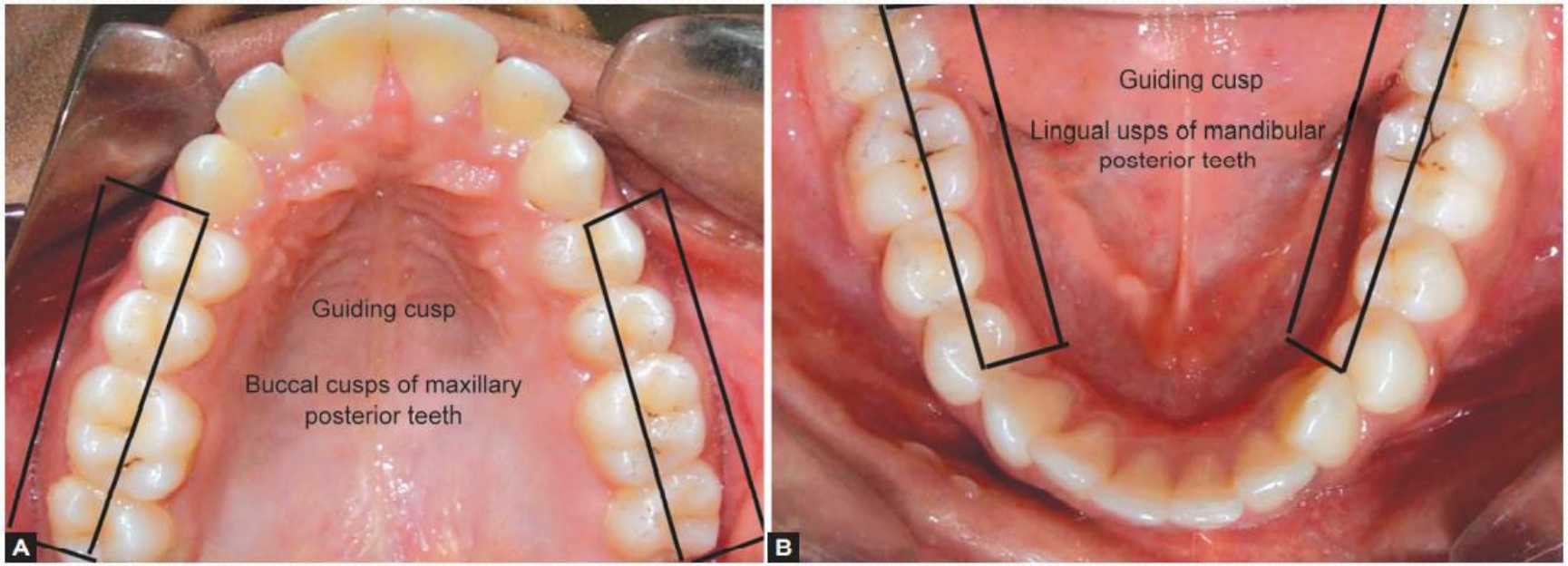


Supporting cusp/centric holding cusp/stamp cusp.





Non-supporting cusp/guiding cusp/shear cusp.



- **Anterior Centric Occlusal Contacts**

Anterior centric occlusal contacts consist of the labial and lingual range of contacts of maxillary

and mandibular anteriors and are in line with the buccal range of posterior centric contacts.

Anterior centric occlusal contacts are listed below: „

- Palatal surfaces of maxillary incisors and canines—6 „
- Labial surfaces of mandibular incisors and canines—6.

Posterior Centric Occlusal Contacts

Posterior centric occlusal contacts consist of the buccal range of contacts and the lingual range

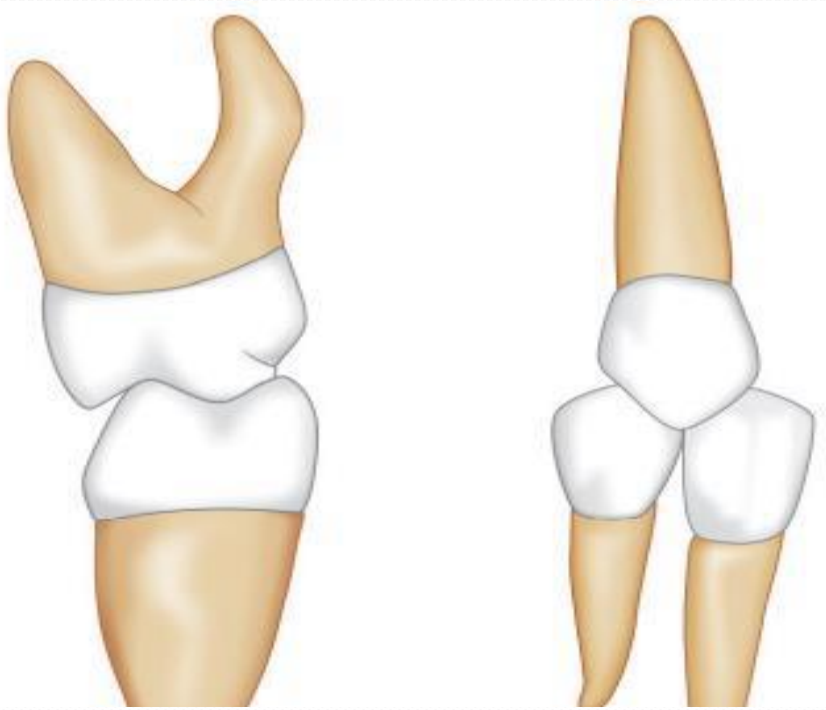
of contacts of maxillary and mandibular posteriors.

Figure

Occlusal contacts for the Maxillary arch and the Mandibular arch.

Cusp-Fossa Occlusion: The supporting cusp of one tooth occludes in a single fossa of a single opposing tooth are referred to as cusp-fossa occlusion or tooth-to-tooth arrangement

Cusp-Embrasure Occlusion: When a tooth occludes with two opposing teeth, it is called cuspembrasure occlusion or tooth to two teeth occlusion



IMAGINARY OCCLUSAL PLANES AND CURVES

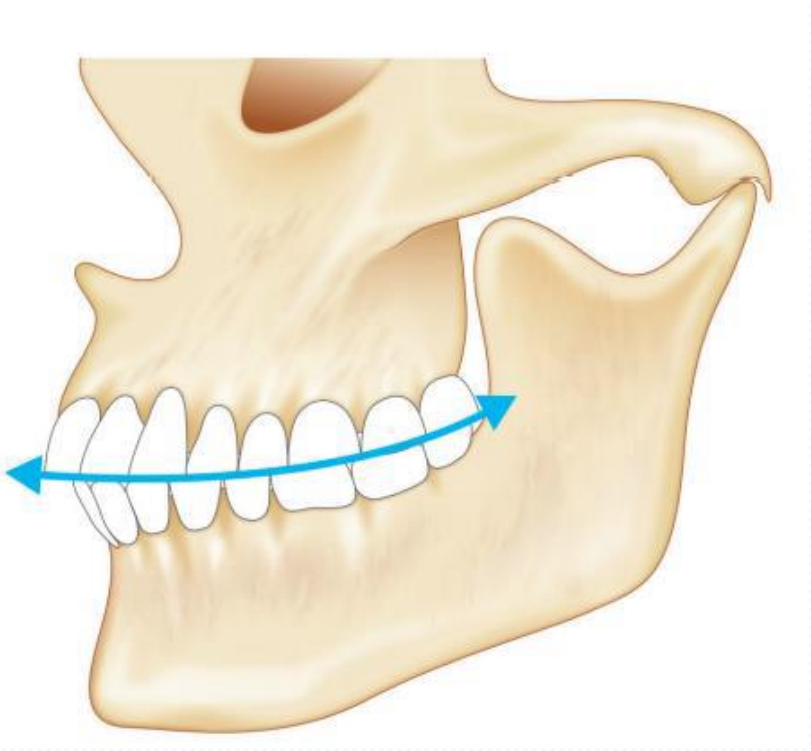
- **Curve of Spee (Anteroposterior Curve/the Curve of Occlusal Plane)**
- lt refers to the anteroposterior curvature of the occlusal surfaces, beginning at the tip of the lower cuspid and following cusp tip of the bicuspids and molars continuing as an arc through to the condyle.
- The curve of the maxillary arch is convex and that of the mandibular arch is concave

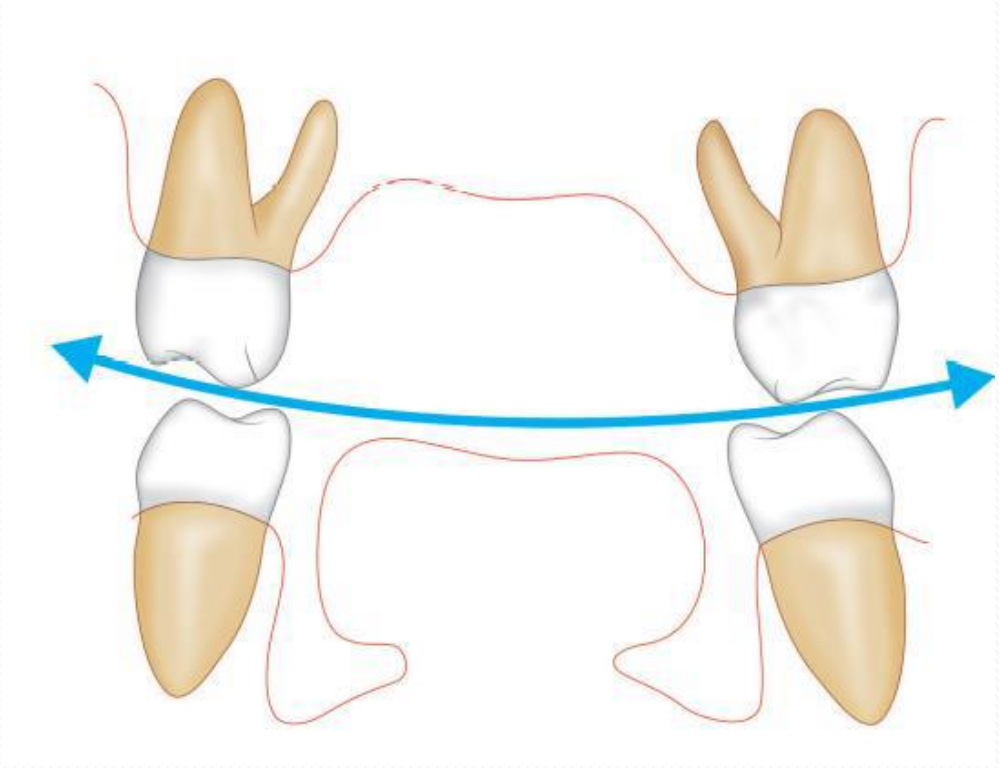
Curve of Wilson (Side-to-Side Curve)

- When viewed from anterior aspect with the mouth slightly open, the cusp tips of the posterior teeth follow a gradual curve from the left side to the right side.
- The curve of the maxillary arch is convex that of the mandibular arch is concave. Thus, the lingual cusps of the posterior teeth are aligned at a lower level than the buccal cusps on both sides and in both arches.

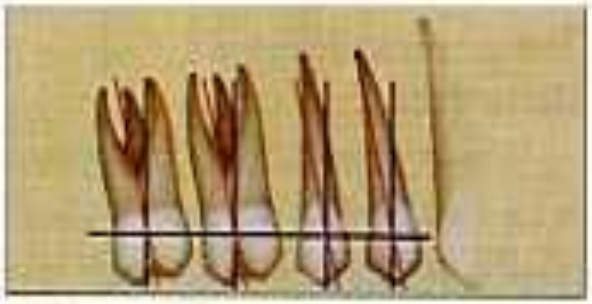
The curve helps in two ways

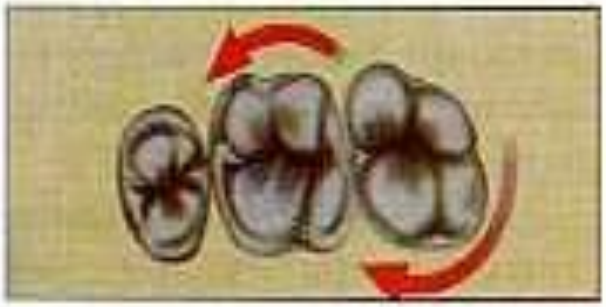
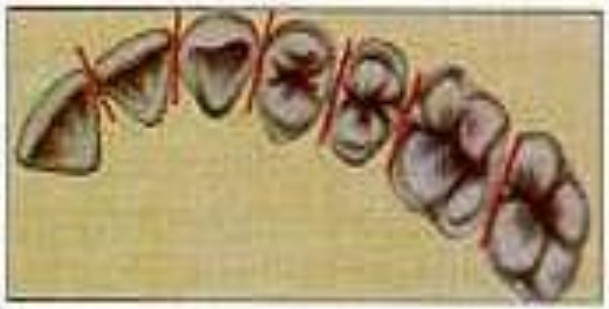
- 1. Teeth aligned parallel to the direction of medial pterygoid for optimum resistance to masticatory forces.
- 2. The elevated buccal cusps prevent food from going 'past the occlusal table.





Andrew's six keys to normal occlusion


	Calcification commences (weeks *in utero*)	Eruption (months)
Primary dentition		
Central incisors	12–16	6–7
Lateral incisors	13–16	7–8
Canines	15–18	18–20
First molars	14–17	12–15
Second molars	16–23	24–36
Root development complete 1–1½ years after eruption		

	Calcification commences (months)	Eruption (years)
Permanent dentition		
Mand. central incisors	3–4	6–7
Mand. lateral incisors	3–4	7–8
Mand. canines	4–5	9–10
Mand. first premolars	21–24	10–12
Mand. second premolars	27–30	11–12
Mand. first molars	Around birth	5–6
Mand. second molars	30–36	12–13
Mand. third molars	96–120	17–25
Max. central incisors	3–4	7–8
Max. lateral incisors	10–12	8–9
Max. canines	4–5	11–12
Max. first premolars	18–21	10–11
Max. second premolars	24–27	10–12
Max. first molars	Around birth	5–6
Max. second molars	30–36	12–13
Max. third molars	84–108	17–25

Root development complete 2–3 years after eruption.

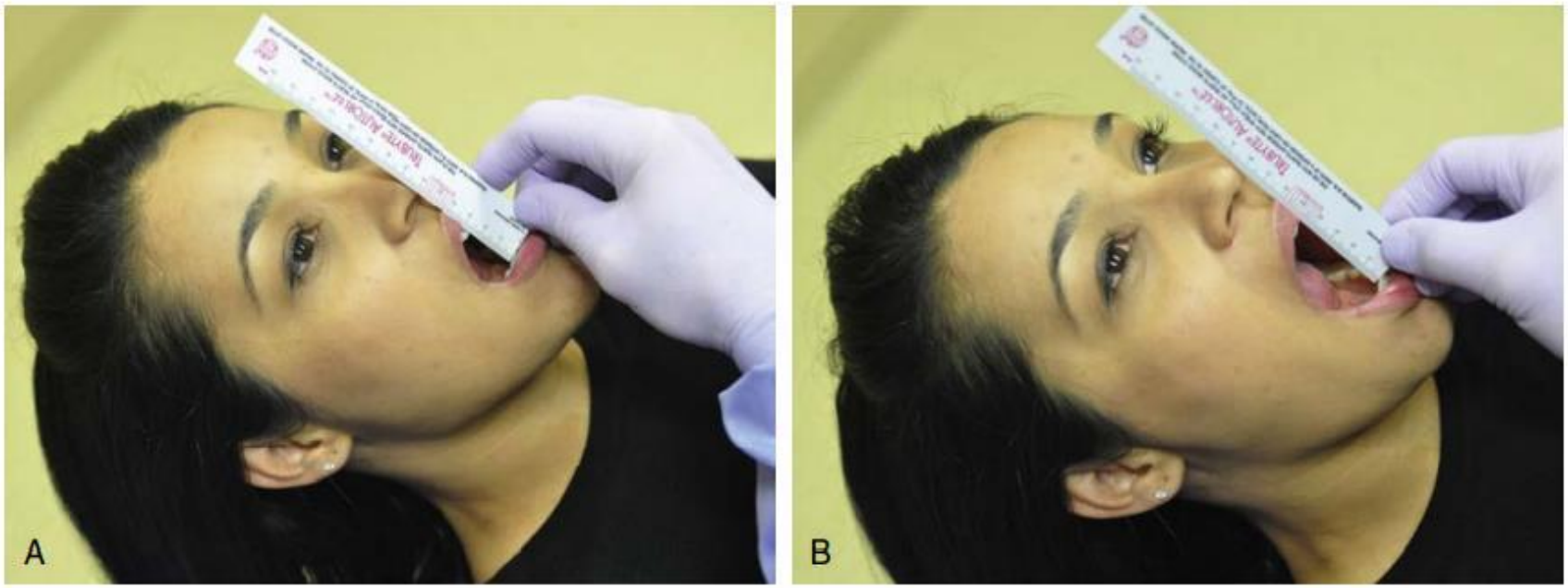
Temporo-mandibular joint dysfunction (TMD)

- The aetiology and management of TMD has caused considerable controversy in all branches of dentistry. TMD comprises a group of related disorders with multifactorial aetiology including psychological, hormonal, genetic, traumatic, and occlusal factors.
- Studies suggests that depression, stress, and sleep disorders are major factors in the aetiology of TMD and that parafunctional activity, for example bruxism, can contribute to muscle pain and spasm.
- Some authors suggested that minor occlusal imperfections can lead to abnormal paths of closure and/or bruxism, which then result in the development of TMD

Muscle Palpation

Temporomandibular Joint Palpation

Range of Mandibular Movement



the maximum comfortable opening and maximum opening

A lateral movement less than 8mm is recorded as a restricted movement.

Functional examination :-

- Improper functioning of the stomatognathic system can result in various malocclusions.
- The functional examination should include :

a. Assessment of postural rest position and inter occlusal space

b. Path of closure

c. Assessment of respiration

d. Examination of TMJ

e. Examination of swallowing

f. Examination of speech

Assessment of postural rest position and inter – occlusal clearance :-

- The postural rest position is the position of the mandible at which the muscles that close the jaws and those that open them are, in a state of minimal contraction to maintain the posture of the mandible.
- At the postural rest position, a space exist between the upper and lower jaws. This space is called the inter occlusal clearance or the freeway space.
- Normally the freeway space is 3mm in canine region.

EVALUVATION 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 a skeletal Class II relationship and an underlying skeletal Class II jaw relationship will position the mandible forward in a "Sunday bite," making the occlusion look better than it really is.

- Sometimes an apparent Class III relationship results from a forward shift to escape incisor interferences in what is really an end-to-end relationship. These patients are said to have pseudo-Class III malocclusion
- ***Backward path of closure:*** classII ,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

A child with an apparent unilateral crossbite usually has a bilateral narrowing of the maxillary arch, with a shift to the unilateral crossbite position. **It is vitally important to verify this during the clinical examination, or to rule out a shift and confirm a true unilateral crossbite**

ASSESSMENT OF RESPIRATION

Humans may exhibit three types of breathing: nasal ,oral and oro-nasal

Test to diagnose the mode of respiration:

- ***Mirror test :*** a double sided mirror is held between the nose and the mouth .fogging on the nasal side of the mirror indicates nasal breathing while fogging towards oral side indicates oral breathing
- ***Cotton test :*** a butterfly shaped cotton piece is placed over the upper lip below the the nostrils . if the cotton flutters down indicates nasal breathing .this test is used to determine the unilateral nasal blockage
- ***Water test:*** the patient is asked to fill his mouth with water and retain it for a long period of time .while nasal breathers accomplish this with ease , mouth breathers find it difficult task.
- ***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 temperomandibular 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

EVALUVATION 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

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

Facial photographs :-

Facial photographs offer a lot of information on the soft tissue morphology and facial expression.

- **The extra oral photographs** :-

These are taken by positioning the patient in such a manner that the F – H plane is parallel to the floor. Frontal view, Profile view , Oblique view

- The intra oral photographs :-

USES OF PHOTOGRAPHS

1. Useful in assessment of facial symmetry ,facial type and profile
2. Serve as a diagnostic records
3. Help in assessing the progress of the treatment

RADIOGRAPHS USED IN ORTHODONTIC DIAGNOSIS

- **Radiograph routinely used for diagnosis in orthodontic s are classified into two groups**

1. **Intra-oral radiograph**
2. **Extra-oral radiograph**

Intra –oral periapical radiographs(I.O.P.A)

- They are radiographs that are used to view the teeth and their supporting structures. **USES**
- To confirm presence or absence of teeth
- To establish presence or absence of supernumerary teeth
- Extent of calcification and root formation of teeth
- To study alveolar bone & PDL
- To determine size and shape of unerupted teeth
- To assess axial inclination of roots

Disadvantages

- Assessment of entire dentition requires too many radiographs.
- They cannot be used in patients with high gag reflex and trismus

Advantages

- Low radiation dose
- Excellent clarity of teeth and their supporting structure
- Possible to obtain localized view of area of interest.

BITEWING RADIOGRAPHS

- It records the coronal part of upper and lower dentition along with their supporting structure.

1. Used to detect proximal caries
2. Height and contour of inter alveolar bone
3. To detect periodontal changes
4. To detect secondary caries below restorations.
5. To determine inter proximal calculus

OCCLUSAL RADIOGRAPHS

- Occlusal radiographs are used in patients who are unable to open their mouth wide enough for periapical radiographs.

Uses

1. To locate impacted or unerupted teeth
2. To locate supernumerary teeth
3. To locate foreign bodies in the jaw
4. To diagnose the presence and extend of fractures

EXTRA-ORAL RADIOGRAPHS

They are useful when large areas of face and skull are to be visualized

PANORAMIC RADIOGRAPH

- It enables viewing of both maxillary and mandibular arches with their supporting structures

USES:

- Studying deciduous root resorption and root development of permanent teeth
- To study the path of eruption of the teeth
- Used to view ankylosed and impacted teeth
- To diagnose presence and extend of pathology and fractures of jaw

ADVANTAGES

- Broad anatomic area can be visualized
- Radiation exposure is low
- Can be used in patient who are unable to tolerate intra oral films or unable to open the mouth

DISADVANTAGES

- Expensive equipment
- Inclination of anterior teeth cannot be visualized
- Less clear images as in periapical films
- Distortion, magnification and overlapping of the structures occur

CEPHALOMETRIC RADIOGRAPHS

- Specialized skull radiograph in which the head is positioned in a specially designed head holder cephalostat.
- It is of two types

1. Lateral cephalogram
2. Postero-anterior cephalogram

HAND-WRIST RADIOGRAPH

Radiograph of hand and wrist are useful in estimating the skeletal age of a person .the hand and wrist region have number of small bones whose appearance and progress of ossification occur in a predictable sequence. This enables skeletal age of a person they are useful in assessing growth for planning growth modification procedures and surgical resective procedures

Refrences

-An Introduction to Orthodontic.fourth edition 2013 United Kingdom--Laura Mitchell, MBE Oxford

-CONTEMPORARY ORTHODONTICS , FifTH EDITION 2013--WILLIAM R. PROFFIT, MOSBY

--Textbook of Orthodontics Second Edition: 2007--Gurkeerat Singh, Jaypee New Delhi 110 002, India

--ORTHODONTIC REVIEW, SECOND EDITION 2015--Jeryl D. Sercan Akyalcin -Timo Peltomäki -Kate Litschel, by Mosby, an imprint of Elsevier Inc

MANAGEMENT OF CLASS I MALOCCLUSION

" Occlusion is the relationship of the maxillary and mandibular teeth when the jaws are in fully closed position.

LINE OF OCCLUSION

- ***FOR UPPER ARCH*** : **Smooth curve passing through the central fossa of each upper molar and across the cingulum of upper canine and incisor teeth.**
- ***FOR LOWER ARCH***: **The same line runs along the buccal cusp and incisal dges of lower teeth.**

A Class I incisor relationship is defined by the British Standards incisor classification as follows: 'the lower incisor edges occlude with or lie immediately below the cingulum plateau of the upper central incisors.

Therefore *Class I malocclusions include those where the anteroposterior occlusal relationship is normal, normal relationship of the molars* **, but** there is a discrepancy either:-

- Within the arches (**line of occlusion incorrect)**
  - **Malposed teeth**
  - **Rotations**
  - **Others**
- And/or in the transverse or vertical relationship between the arches

- Approximately ***60%-70%*** of all cases of malocclusion fall into this class

Features of class I malocclusion

- **Harmonious face**
- **Straight to convex profile**

- **Lip competence is dependant on degree of anterior proclination**
- **Class I relationship of the molars, canine& incisor but line of occlusion incorrect**
- **Individual tooth malocclusion with varying degree of severity**
- **Malocclusion may be in vertical and transverse planes.**

class I malocclusion **include:-**

- **openbite**
- **Deep bite**
- **Bi-maxillary protrusion**
- **Crossbite**
- **Malposed teeth**
- **Rotations**
- **Spacing of teeth**
- **Crowding**

CAUSES OF CLASS I MALOCCLUSION

- **DEVELOPMENTA** INCLUDES:
  - **Supernumerary teeth.**
  - **Impacted teeth**
  - **Ectopic eruption**
  - **Congenitally missing teeth.**
  - **Malformed teeth.**

- **GENETIC Plays major role for malocclusion where there is discrepancy between the size of jaws and size of teeth.**
- **ENVIRONMENTAL CAUSED BY Injuries which has two types:**

- **BIRTH INJURIES: Trauma during birth from usage of forceps.**
- **INJURIES THROUGHOUT LIFE: trauma to teeth can lead to:**
  - **Damage to permanent tooth bud.**
  - **Premature loss of primary teeth leads to permanent tooth movement.**
  - **Direct injury to permanent teeth.**

- In Class I malocclusions the skeletal pattern is usually Class I, but it can also be Class II or Class III with the inclination of the incisors compensating for the underlying skeletal discrepancy i.e. dento-alveolar compensation.
- In most Class I cases the soft tissue environment is favourable and is not an aetiological factor.
- The major exception to this is bimaxillary proclination, where the upper and lower incisors are proclined. This may be racial in origin and can also occur because lack of lip tonicity results in the incisors being moulded forwards under tongue pressure

MANAGEMENT OF CLASS I MALOCCLUSION

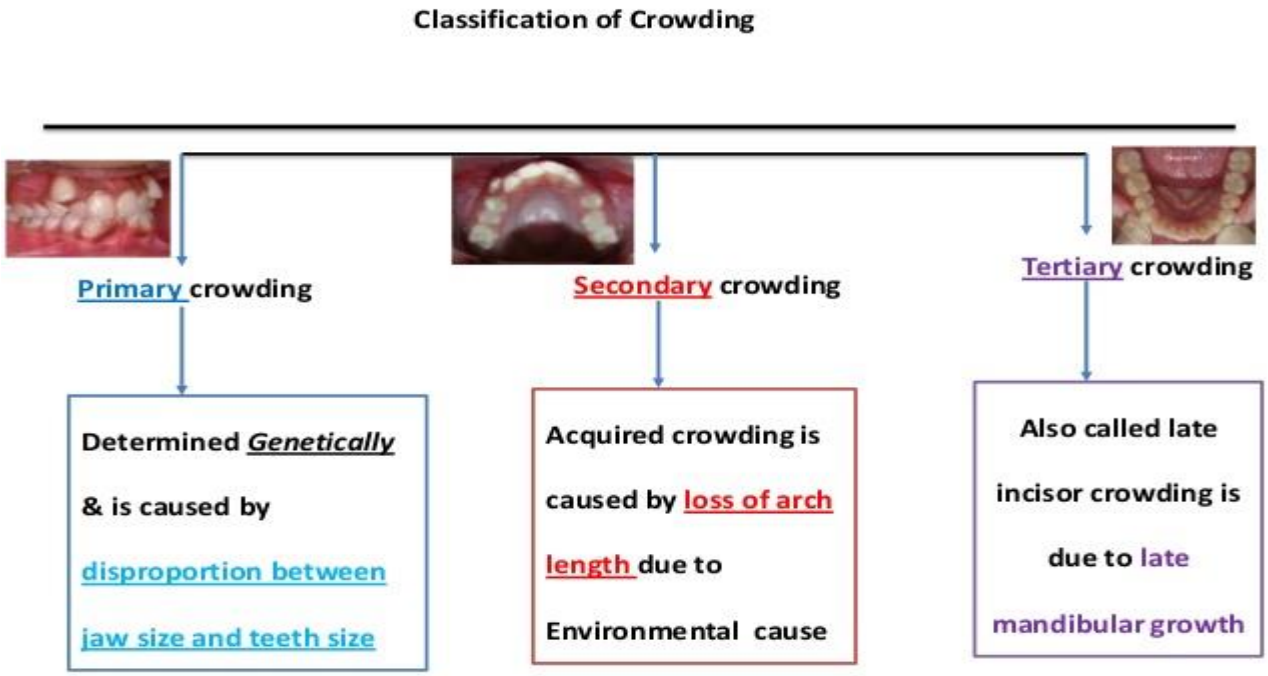
CROWDING: **'Is defined as malalignment of teeth caused by inadequate space.'**

- **Occurs due to GENETIC or ENVIRONMENTAL factors.**

Those teeth that erupt last in segment, e.g. lateral incisors, upper canines, 2nd premolars, 3rdmolars are most commonly affected

there are different methods of classification of crowding

Classified according to the etiology



Late lower incisor crowding

Physiologically, in most individuals, the intercanine width increases up to around 12 to 13 years of age, and this is followed by a very gradual diminution throughout adult life. The rate of decrease is most noticeable during the mid to late teens. This reduction in intercanine width results in an increase of any pre-existing lower labial crowding, or the emergence of crowding in arches which were well aligned or even spaced in the early teens. Therefore, to some extent, lower incisor crowding can be considered as an age change.

The aetiology of late lower incisor crowding is recognized as being multifactorial: the following have been proposed as influences in the development of this phenomenon;

1. Forward growth of the mandible (either horizontally or manifesting as a growth rotation) when maxillary growth has slowed, together with soft tissue pressures, which result in a reduction in lower arch perimeter and labial segment crowding.

2. Soft tissue maturation.

3. Mesial migration of the posterior teeth owing to forces from the interseptal fibres and/or from the anterior component of the forces of occlusion.

4. The presence of an erupting third molar pushes the dentition anteriorly, i.e. the third molar plays an active role.

Crowding Classified according to the severity as:

- **Mild crowding --- less than 4mm per arch.**
- **Moderate crowding --- 5 to 9mm per arch.**
- **Severe crowding --- 10mm or more per arch.**

Before carrying out treatment,the following aspects should be considered:

- **Degree of crowding.**
- **Site and position of crowding.**
- **Patient's age.**

Treatment of Crowding

1.Mild crowding: accepted or Usually resolves without extraction

- -Proximal stripping
- Arch expansion ,
- -Molar distalization

2. Moderate crowding:

- -Enamel reduction.
- Or by extractions
- -Arch expansion ,
- -Molar distalization

***3. Severe crowding*:** -Extraction of first premolars

A degree of natural spontaneous movement will take place. In general, this is greater under the following conditions:

- in a growing child;
- if the extractions are carried out just prior to eruption of the adjacent teeth;
- where the adjacent teeth are favourably positioned to upright if space is made available (for example considerable improvement will often occur in a crowded lower labial segment provided that the mandibular canines are mesially inclined);
- there are no occlusal interferences with the anticipated tooth movement

Displaced teeth

Teeth can be displaced for a variety of reasons including the following:

• **Abnormal position of the tooth germ** :

Canines and second premolars are the most commonly affected teeth. Management depends upon the degree of displacement. If this is mild, extraction of the associated primary tooth plus space maintenance, if indicated, may result in an improvement in position in some cases. Alternatively, exposure and the application of orthodontic traction may be used to bring the mildly displaced tooth into the arch. If the displacement is severe, extraction is usually necessary.

• **Crowding** : Lack of space for a permanent tooth to erupt within the arch can lead to or contribute to displacement.

- **Retention of a deciduous predecesso**r:

Extraction of the retained primary tooth should be carried out as soon as possible provided that the permanent successor is not displaced.

• **Secondary to the presence of a supernumerary tooth or teeth**:

Management involves extraction of the supernumerary followed by tooth alignment, usually with fixed appliances. Displacements due to supernumeraries have a tendency to relapse and prolonged retention is required.

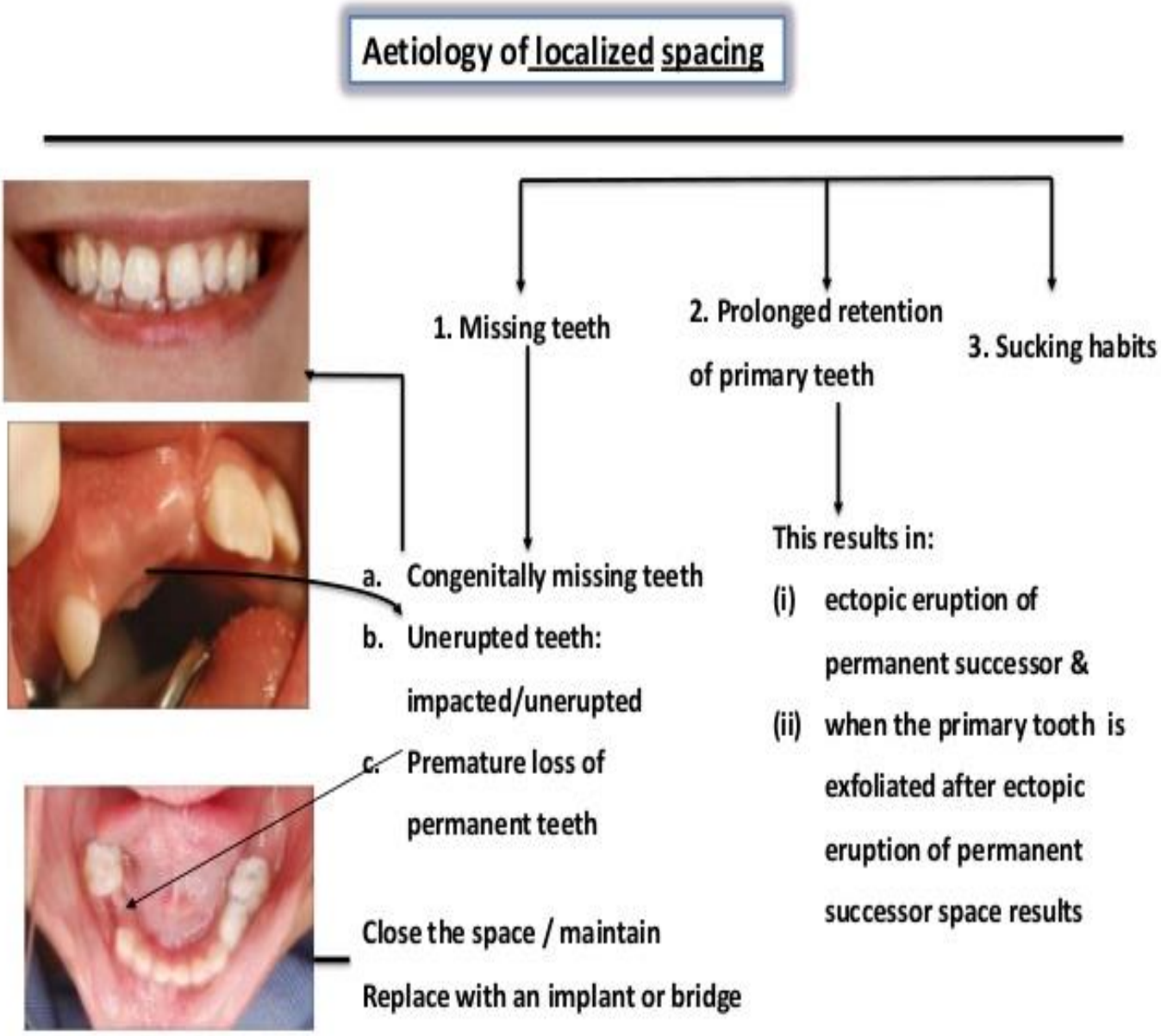
- **Habit**.

• **Secondary to pathology**, for example a dentigerous cyst. This is the rarest cause.

<u>SPACING:</u> ‘Gaps between two teeth or many teeth’ Can be:

- **Localized (space present in localized regions or areas)**
- **Generalized (space present in entire arch)**

- **Localized spacing may be due to hypodontia; or loss of a tooth as a result of trauma; or because extraction is indicated because of displacement, morphology, or pathology. This problem is most noticeable if an upper incisor is missing as the symmetry of the smile is affected, a feature which is usually noticed more by the lay public than other aspects of a malocclusion**.



A. Hypodontia

Hypodontia is defined as the congenital absence of one or more teeth. The prevalence in a Caucasian population (excluding the third molars) has been reported as being between 3.5 to 6.5 percent.

The third molars are missing in approximately 25–35 percent of the population. The next most commonly missing teeth are the second premolars (3 percent) followed by the upper lateral incisors (2 percent). Missing teeth are also found more commonly in patients with a cleft lip and/or palate.

Etiological factors

1. Familial tendency.
2. Association with syndromes (e.g. ectodermal dysplasia).
3. Delayed or an interference cause a defect during dental development.

Management of missing upper incisors

There are basically three approached to manage missing incisors:

1. Space closure
2. Space maintenance or opening
3. Auto-transplantation

Median diastema

Is a form of localised spacing wherein there is a space present b/w two central incisors

Causes of median diastema

- **Normal/developmental**
  - 1. Physiological median diastema
  - 2. Ethnic & familial
  - 3. Imperfect fusion at midline of premaxilla
- **Tooth material discrepancy**
  - 1. Micodontia
  - 2. Macrognathia
  - 3. Missing lateral
  - 4. Peg lateral
  - 5. Extracted teeth
- **Physical impediment**
  - 1. Retained deciduous
  - 2. Mesiodens
  - 3. Enlarged labial frenum
  - 4. Midline pathology
- **Habits**
  - 1. Thumb sucking
  - 2. Tongue thrusting
- **Artificial causes**
  - RME

MANAGEMENT

a) REMOVAL OF CAUSE

DIASTEMA DUE TO RETAINED DECIDUOS TEETH/MESIODENS

The retained deciduous tooth or mesiodens should be extracted at the earliest.

DIASTEMA DUE TO ABNORMAL FRENUM

Frenectomy should be done to excise a thick fleshy frenum.

DIASTEMA DUE TO MIDLINE PATHOLOGY

Midline pathology like cysts has to be treated.

DIASTEMA DUE TO ABNORMAL HABITS

Habits should be eliminated using fixed or removable habit breakers.

b) ACTIVE TREATMENT

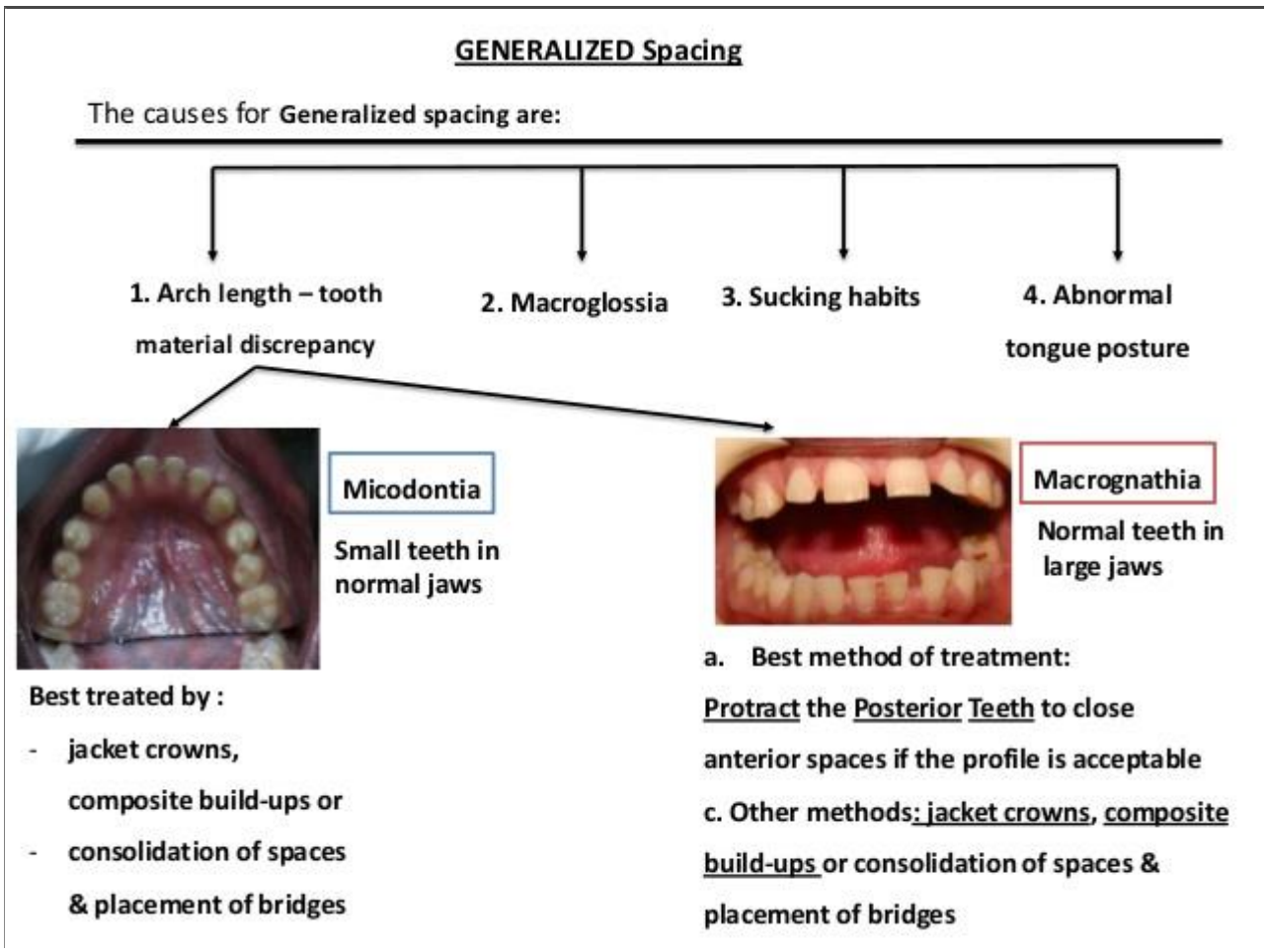
- , Closure of a midline diastema can be accomplished with a removable appliance and finger springs to tip the teeth mesially.
- Closure by bodily movement using a Fixed appliances incorporating elastics and springs bring about the most rapid correction of midline diastema
- Closure by reduction of over jet if the space result from proclination of incisors

- Restorative mangment, Esthetic composite resins are used to close midline diastema especially in adult patients.

c) RETENTION Midline diastema is often considered easy to treat but difficult to retain. Retention can be achieved by Lingual bonded retainers or Hawley's retainer

GENERALIZED SPACING

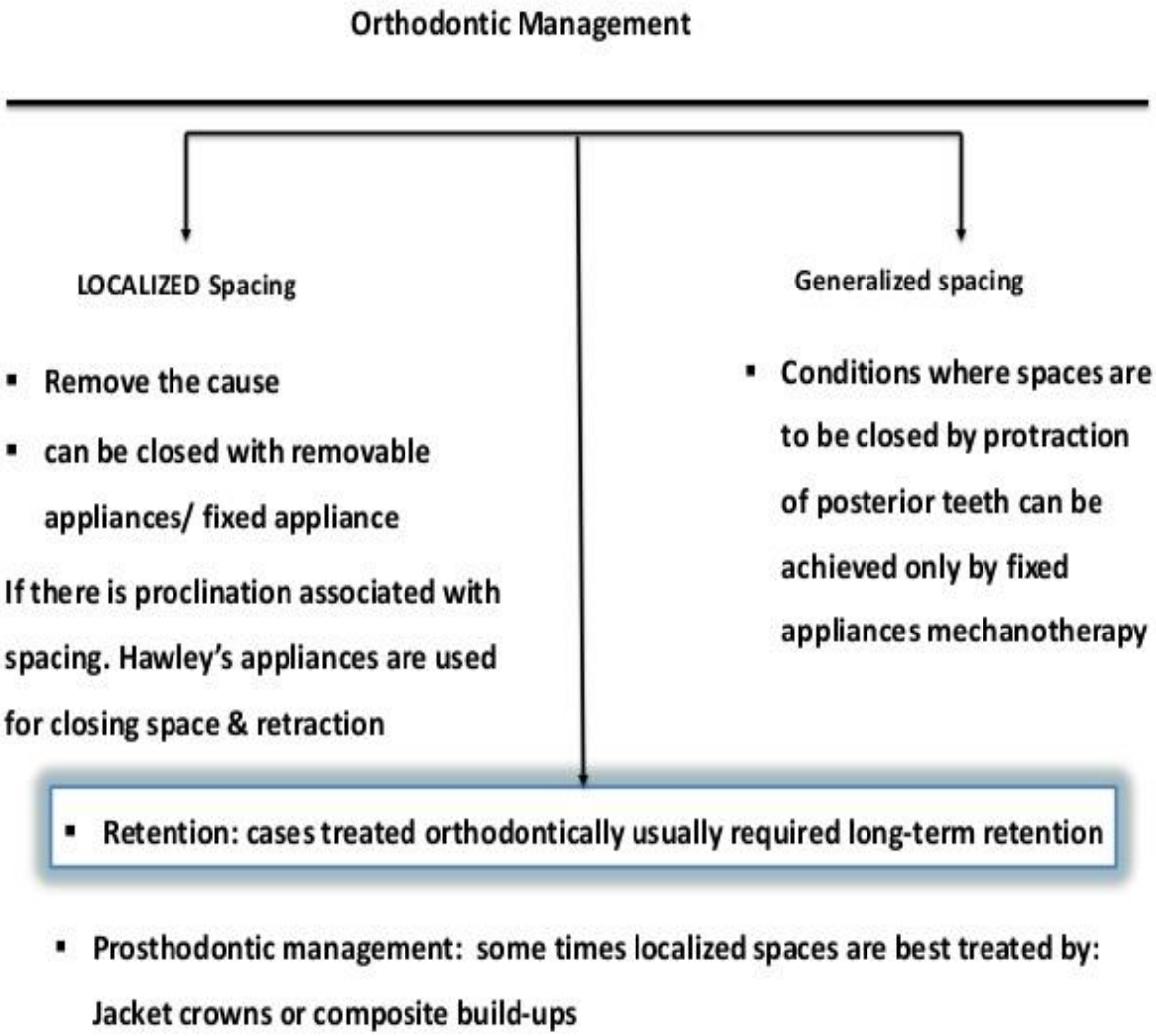
Generalized spacing is rare and is due to either hypodontia or small teeth in well-developed arches.



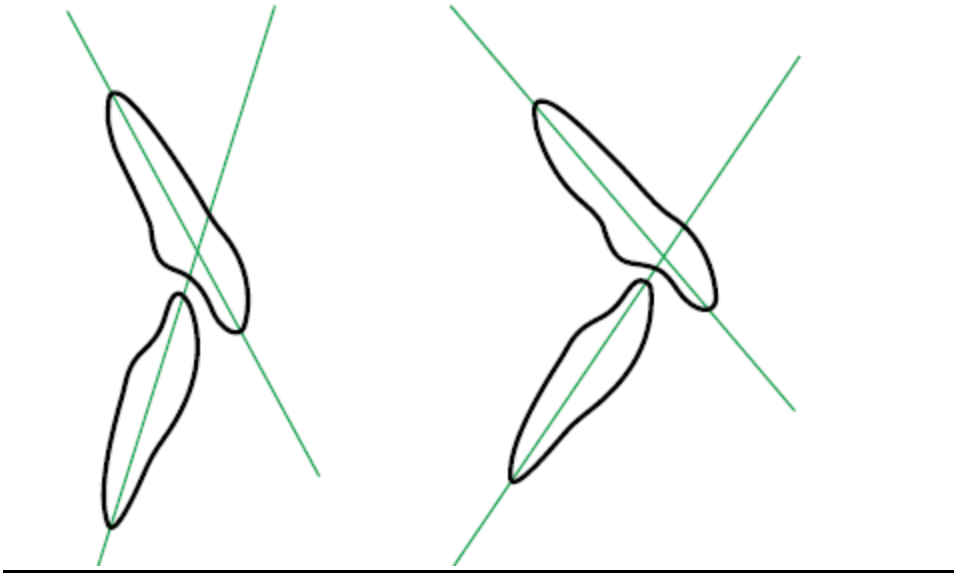
- **Orthodontic management of generalized spacing is frequently difficult as there is usually a tendency for the spaces to reopen unless permanently retained**
- **In milder cases it may be wiser to encourage the patient to accept the spacing,**

IN CASE OF MICRODONTIA

- **if the teeth are narrower than average, acid-etch composite additions or porcelain veneers can be used to widen them and thus improve aesthetics.**
    - **or . In severe cases of hypodontia, a combined orthodontic–restorative approach to localize space(Eliminate spaces between anteriors, leaving a space between canine and 1st premolar)& prosthesis or implant , will be required.**



BIMAXILLARY PROTRUSION: **The patient exhibits a normal class I molar relationship but the dentition of both the upper and lower arches are forwardly placed in relation to facial profile**



Normal vs bimaxillary proclination

EXTRAORAL FEATURES

- **Decreased nasolabial angle due to proclined maxillary anteriors**
- **Shallow mentolabial sulcus due to proclined mandibular anteriors.**
- **Lips may be incompetent**
- **Convex facial profile**

INTRAORAL FREATUES

- **Class I canine relationship (may be)**
- **Spacing between teeth. (may be)**
- **Maxillary and mandibular anterior proclination.**
- **Class I molar relationship**

CEPHALOMATRIC FINDINGS

- **Decreased interincisal angle**
- **Increased incisor mandibular plane angle**
- **Increased SNA and SNB, if there is prognathism of jaws.**

- Management is difficult because both upper and lower incisors need to be retroclined.
- Retroclination of the lower labial segment will encroach on tongue space and therefore has a high likelihood of relapse following removal of appliances
- For these reasons, treatment of bimaxillary proclination should be approached with caution and consideration should be given to accepting the incisor relationship.
- If the lips are incompetent, but have a good muscle tone and are likely to achieve a lip-to-lip seal if the incisors are retracted, the chances of a stable result are increased.
- Where bimaxillary proclination is associated with competent lips, or with grossly incompetent lips which are unlikely to retain the corrected incisor position, it may be wiser not to proceed.
- However, if treatment is decided upon, permanent retention is advisable.

Vertical discrepancies

Variations in the vertical dimension can occur in association with any anteroposterior skeletal relationship.

Transverse discrepancies

A transverse discrepancy between the arches results in a crossbite and can occur in association with Class I, Class II, and Class III malocclusions.

Ass. Prof. Zena Hekmat

ORAL HABITS

Is the action which by repetition become spontaneous

Oral habits are:-

- Thumb sucking.
- Tongue thrusting.
- Mouth breathing
- Bruxism
- Nail biting
- Lip biting.

Thumb & Finger Habits

About two thirds are ended by 5 years of age. The types of dental changes that a digit habit may cause vary with the intensity, duration, and frequency of the habit as well as the manner in which the digit is positioned in the mouth.

-Intensity is the amount of force that is applied to the teeth during sucking.

-Duration is defined as the amount of time spent sucking a digit

-Frequency is the number of times the habit is practiced throughout the day

The most common dental signs of an active habit are reported to be the following:

-Anterior open bite

-Facial movement of the upper incisors and lingual movement of the lower incisors. The result is an increased overjet and, by virtue of the tipping, decreased overbite

-Lips:-Upper lip may be short and hypotonic

Lower lip is hyperactive

-Maxillary constriction (decreased hard palate width) with can result in posterior crossbite.

Extraoral Examination :-(i) The digits:-Digits that are involved in the habit will appear reddened, exceptionally clean, chapped & short fingernail (dishpan thumb)Fibrous roughened callus may be present on superior aspect of finger.

Treatment of Thumb & Finger Habits

-At first consultation with his family and with him.

-The second approach, reminder therapy, is appropriate for those who desire to stop the habit but need some help.

-An adhesive bandage secured with waterproof tape on the offending finger can serve as a constant reminder.

-Another approach is to paint a commercially available bitter substance on the fingers that are sucked.

Then the orthodontic appliances can used so fixed habit breaker (the palatal crib) is designed to interrupt a digit habit by interfering with finger placement and sucking satisfaction.

bands are fitted on the permanent first molars or primary second molars. A heavy lingual arch wire (38 mil) is bent to fit passively in the palate and is soldered to the molars bands.

The parent and child should be informed that certain side effects appear temporarily after the palatal crib is cemented.

Eating, speaking, and sleeping patterns may be altered during the first few days after appliance delivery, these difficulties usually subside within 3 days to 2 weeks. An imprint of the appliance usually appears on the tongue as an indentation.

Removable orthodontic appliance also can be used

as, Hawley appliance with a palatal bar may be fitted.

. Active oral screen: corrects the habit and corrects the protruded incisors.

Pacifier Habits

Dental changes created by pacifier habits are largely similar to changes created by thumb habits, and no clear consensus indicates a therapeutic difference.

Anterior open bite and maxillary constriction occur consistently in children who suck pacifiers.

Pacifier habits appear to end earlier than digit habits

Lip Habit

Habit that involve manipulation of the lips and perioral structures

LIP appearance

Red, inflamed, and chapped lips and perioral tissue during cool weather.

The result is a proclination of the maxillary incisors, a retroclination of the mandibular incisors, and an increased amount of overjet.

TREATMENT
By the orthodontic appliance like lip bumper &oral screen and treat the malocclusion

Tongue thrusting
Definition:-¬ The forward movement of tongue tip between the teeth to meet the lower lip during deglutition and in sounds speech so that tongue becomes interdental

Clinical features :
- Extra oral
(1) Lip Posture :- Lip separation is more both at rest & in function
(2) Mandibular movement :- Path of mandible movement is upward & backward with tongue movement forward.
(3) Speech : Lipsing problem in articulation of s/n/t/d/ l/th/z/v/ sounds.

(a) Facial form :- increase anterior facial height

- Intraoral

(1) Tongue posture:-Tongue tip at rest is lower because of anterior open bite present

(2) Tongue movement :- Movement is irregular from one swallow to another.

- Malocclusion:-

In maxilla Proclination of maxillary anterior .

-Open bite

-An increase over jet

-Maxillary constriction

- Generalized spacing between teeth.

In Mandible :- Retroclination of mandible

Management:-It is aimed at teaching the child correct positioning of tongue

1) Patient is instructed to put the tip of tongue at correct positions and swallow with Lip pursed and teeth in occlusion

.2) Training to correct swallow and posture of tongue.

3) Flat sugarless fruit drop can be placed on back of the tongue & it is held against the palate in the correct position until it is completely dissolving twice a day.

4) When patient learn normal tongue position this has to be reinforced and made into on unconscious act.

5) Appliance therapy used can be either fixed with band palatal rake or removable with adam's clasp.

6) Nance Palatal Arch Appliance – in this acrylic button can be used as to guide the tongue in right position.

7) Removable appliance therapy

8) Fixed Habit breaking Appliance

Mouth breathing habits

 Definition:- Sassouni (1971) Mouth breathing as habitual respiration through the mouth instead of the nose.

 Etiology:- It is estimated that 85% mouth breather suffer from some degree of nasal obstruction

1. Developmental Anomalies like abnormal development of nasal cavities .

2. Partial obstruction in deviated nasal septum and Localized benign tumor.

3. Infection inflammation of nasal mucosa as:- Chronic allergic, chronic atrophic Rhinitis, Enlarged adenoid tonsils

(4) Traumatic injures of nasal cavity

(5) Genetic Pattern

Clinical Features: -

Facial appearance of child with mouth breathing habit is termed as Adenoid facies.

Long narrow face.

narrow nose and nasal passage.

Short upper lip.

Nose tipped superiorly

Expressionless face.

θ Dental effect (intra oral)

- Protusion of maxillary incisors
- Open bite
- Palatal vault is high.
- Increase incidence of caries.
- Chronic marginal gingivitis.

Diagnosis :-

(1) History:- The parents can be questioned whether the child adopts frequent lip apart posture&Frequently occurrences of tonsillitis, allergic rhinitis.

(2) Examination:-

(i) Observe the patient unknowingly while at rest in a nasal breather

– lip touch lightly in mouth breather

– Lip are kept apart.

(ii) Patient asked to take deep breath Nasal breather keep the lip tightly closed Mouth breather take deep breath keeping mouth open.

(iii)Clinical test: -

(a) Mirror test:- Double side mirror is held b/w the nose and mouth fogging on the nasal side of mirror indicate nasal breathing while fogging toward the oral side indicate oral breathing.

(b) Water test:- The patient is asked to fill the mouth with water, and hold it for a period of time. While nasal breather accomplishes with ease, mouth breather find the task difficult.

(c) Cotton test:- A butterfly shaped piece of cotton is placed over the upper lip below the nostril. If cotton flutters down it indicate nasal breathing.

Management:-

1)Elimination of the cause- If nasal or pharyngeal obstruction has been diagnosed then removal of the cause is done by surgery .

2) Interception of the habit-

a)Physical Exercise

b)Lip Exercise

3) Oral Screen –¬ The most effective way to reestablish nasal breathing is to prevent air entering the oral cavity .

holes should be found in it and begain to close it gradually.

Bruxism

Bruxism is a grinding of teeth and is usually reported to occur while a child is sleeping.

Masticatory muscle soreness and temporomandibular joint pain have also been attributed to bruxism.

The exact cause of significant bruxism is unknown, although most explanations center around local, systemic, and psychological reasons.

The local theory suggests that bruxism is a reaction to an occlusal interference, high restoration, or some irritating dental condition.

Systemic factors implicated in bruxism include intestinal parasites, subclinical nutritional deficiencies, allergies, and endocrine disorders.

The psychological theory submits that bruxism is the manifestation of a personality disorder or increased stress.

Treatment should begin with simple measures. Occlusal interferences should be identified and equilibrated if necessary.

If occlusal interferences are not located or equilibration is not successful, referral to appropriate medical personnel should be considered to rule out any systemic problems.

If neither of these two steps is successful a mouthguard like appliance can be constructed of soft plastic to protect the teeth and attempt to eliminate the grinding habit.

If the bruxism appears to be a stress response, stress management, behavioral therapy, or biofeedback may be effective.

Nail biting

It is most common habit in children

 It is sign of internal tension

Etiology :-

 Persistence nail biting may be indicative of emotional problem

 Psychosomatic

 Successor of thumb sucking

Clinical features:-

 Crowding

 Rotation

 Alteration of incisal edge of incisor

 Inflammation of nail bed.

Management:-

 Patient is made aware of problem.

 Treat the basic emotional factor causing the act.

 Encouraging outdoor activity which may help in easing tension.

 Application of nail polish, light cotton mittens as reminder

Conclusion

The identification and assessment of an abnormal habits and its immediate and long-term effect on the craniofacial complex and dentition should be made as early as possible to minimize the potential deleterious effect on dentofacial Complex.

References

-Proffit, WR, Fields, HW. 2012. Contemporary orthodontics. 5th ed. St. Louis (MO): Mosby Elsevier.
-Simon j.Littlewood and Laura Mitchell 2019 An introduction to Orthodontics Fifth Edition
-Graber TM (2000) Orthodontics Principles and practice, Missouri: Mossby C.
-T. D. FOSTER (1990) A Textbook of Orthodontics Third edition
-Textbook of Pediatric 3rd Edition Prof S.G dentistry Damle

Orthodontic treatment plan phases:

1-Preventive Orthodontics

2- Interceptive Orthodontics

3-Corrective Orthodontics

- **Preventive Orthodontics**: Includes all those procedures undertaken to preserve the integrity of normally developing occlusion by protecting current conditions or preventing situations that would interfere with growth by the following measures

- 1-Parent education
- 3-Maintenance of shedding and eruption timetable
- 4-Management of premature loss of deciduous teeth:
- 5- Management of ankylosis of deciduous teeth:
- 6- Prolonged retention of deciduous teeth
- 7-Extraction of Supernumerary Teeth
- 8- Management of Oral Habits
- 10-Treatment of Occlusal Prematurity:
- 11-Management of Abnormal Frenum Attachment
- 12- Space maintainers

- **Interceptive orthodontics:** "that phase of science and art of orthodontics employed to recognize and eliminate potential irregularities and malpositions in the developing dentofacial complex"

- **Interceptive Orthodontics:**
- Interceptive orthodontics is undertaken at a time when malocclusion has already developed or developing. The difference between preventive and
- interceptive orthodontics lies in the timing of the services rendered. Preventive orthodontic procedures are undertaken when the dentition and occlusion are perfectly normal, while the interceptive procedures are carried out when signs and symptoms of a developing malocclusion are evident.
- Interceptive orthodontic procedures may include:

- 1-serial extraction
- 2-Correction of developing cross-bites
- 3-Control of abnormal oral habits
- 4-Proximal stripping of deciduous teeth to facilitate the eruption of adjacent permanent teeth
- 5-Correction of occlusal interferences
- 6-Interception of skeletal malrelations
- 7- Space regaining
- 9-Muscle exercises

Corrective early treatment:

Complete or nearly complete correction of an orthodontic problem.

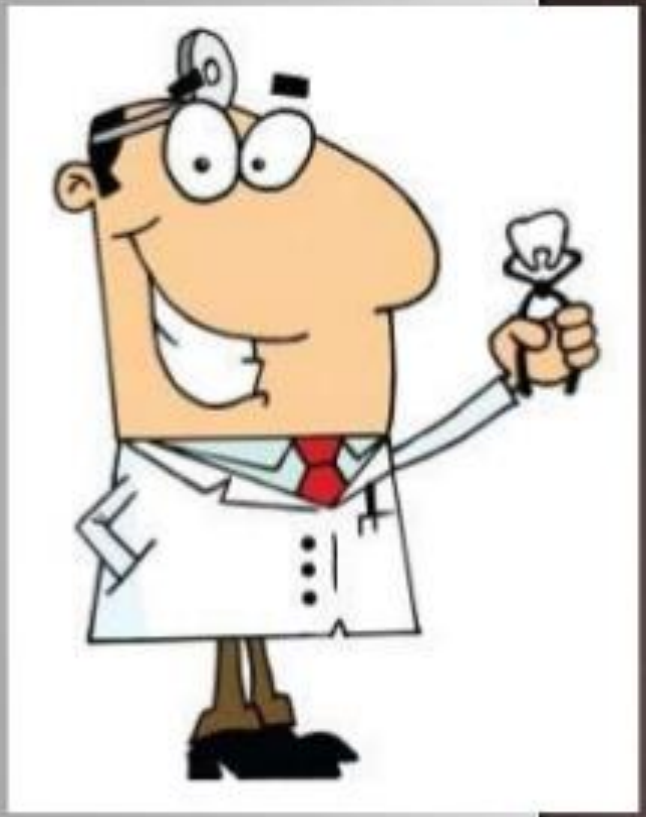
e.g. Expansion appliances, growth modification appliances, alignment of anterior teeth.

II. Goals of Early Treatment

Overall goal of early treatment:

To improve or correct orthodontic problems that would result in:

- Irreversible damage to the dentition and supporting structures.
- Progression into a more severe orthodontic problem that would be more difficult to treatment in Phase II.



SERIAL EXTRACTION

Management

Serial Extraction: A planned sequence of tooth removal during the transition from primary to permanent dentition to promote eruption of teeth through attached gingiva and reduce the severity of crowding.

Eruption sequence of the permanent dentition: Maxilla: 6 1 2 4 5 3 7 8

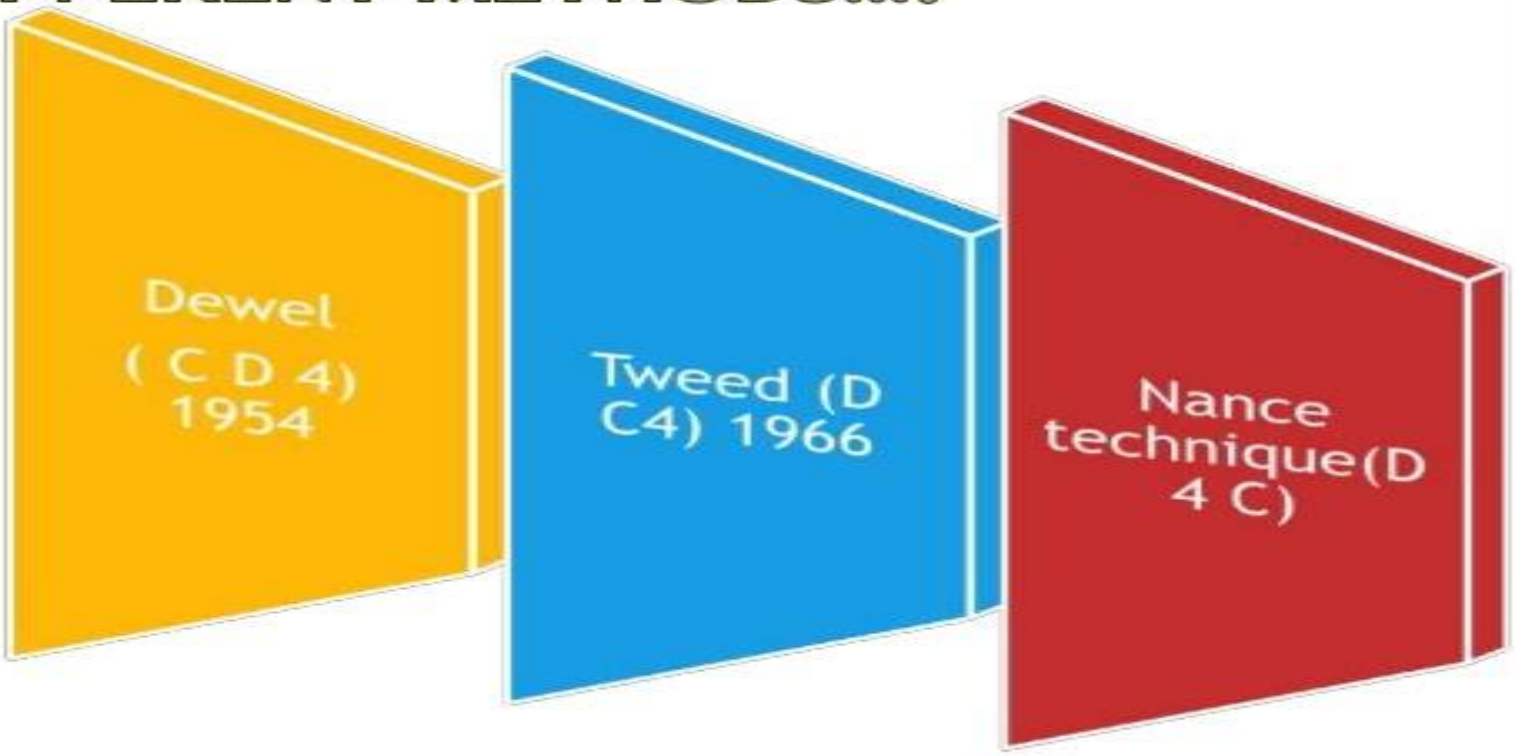
Mandible: 6 1 2 (3 4) 5 7 8

Serial Extraction

Case selection:

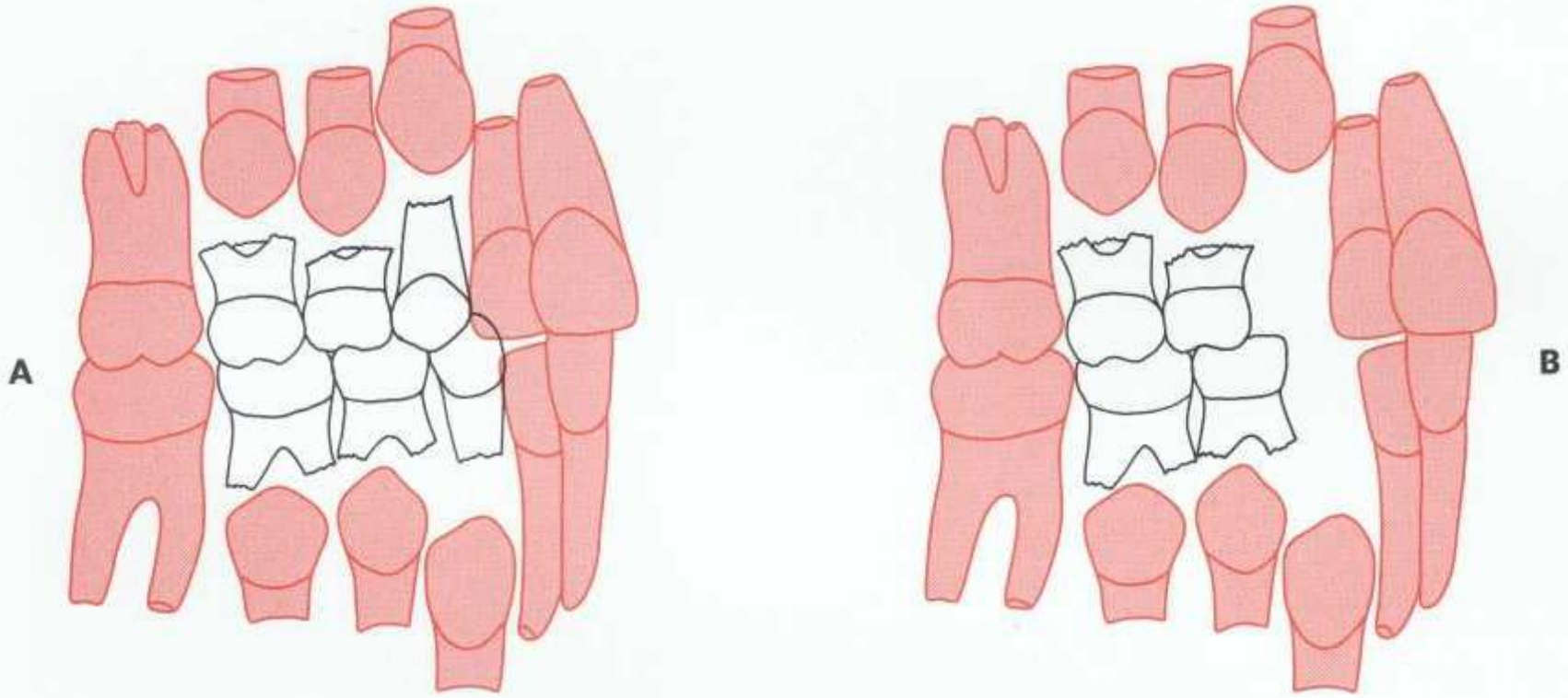
1. No skeletal disproportions
2. Class I molar relationship
3. Non-retrusive lip profile
4. Normal overbite
5. Coincident midlines
6. crowding.

3 DIFFERENT METHODS....



procedure:

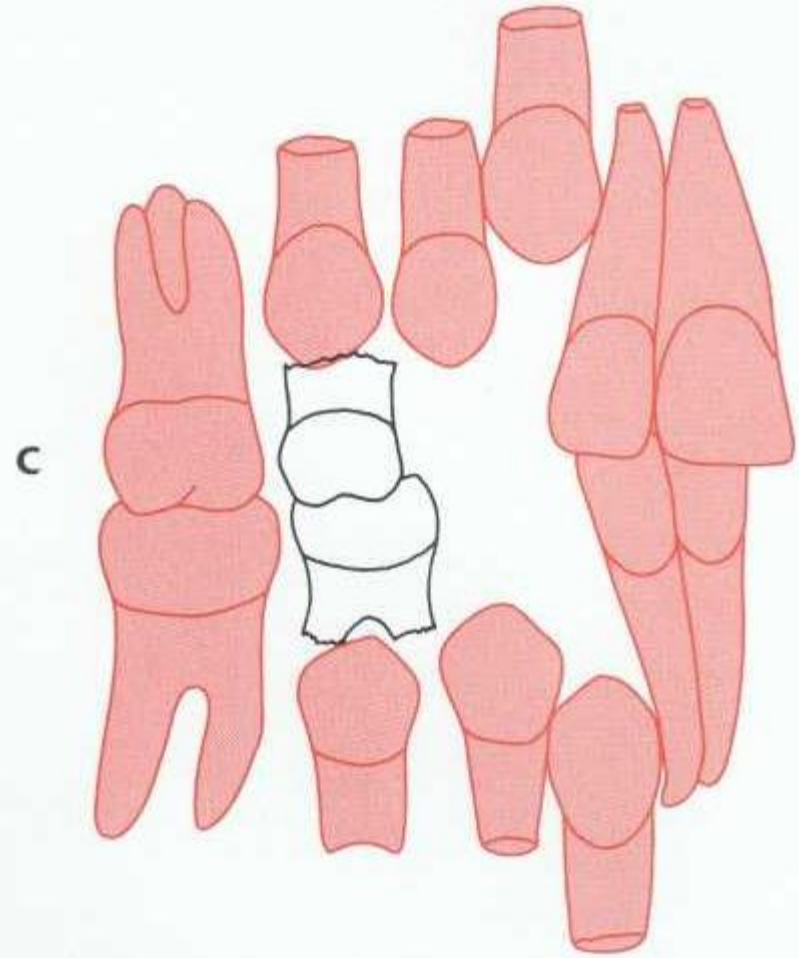
Extraction of Cs as soon as the permanent incisors complete their eruption, such extraction will allow spontaneous relief of crowding.



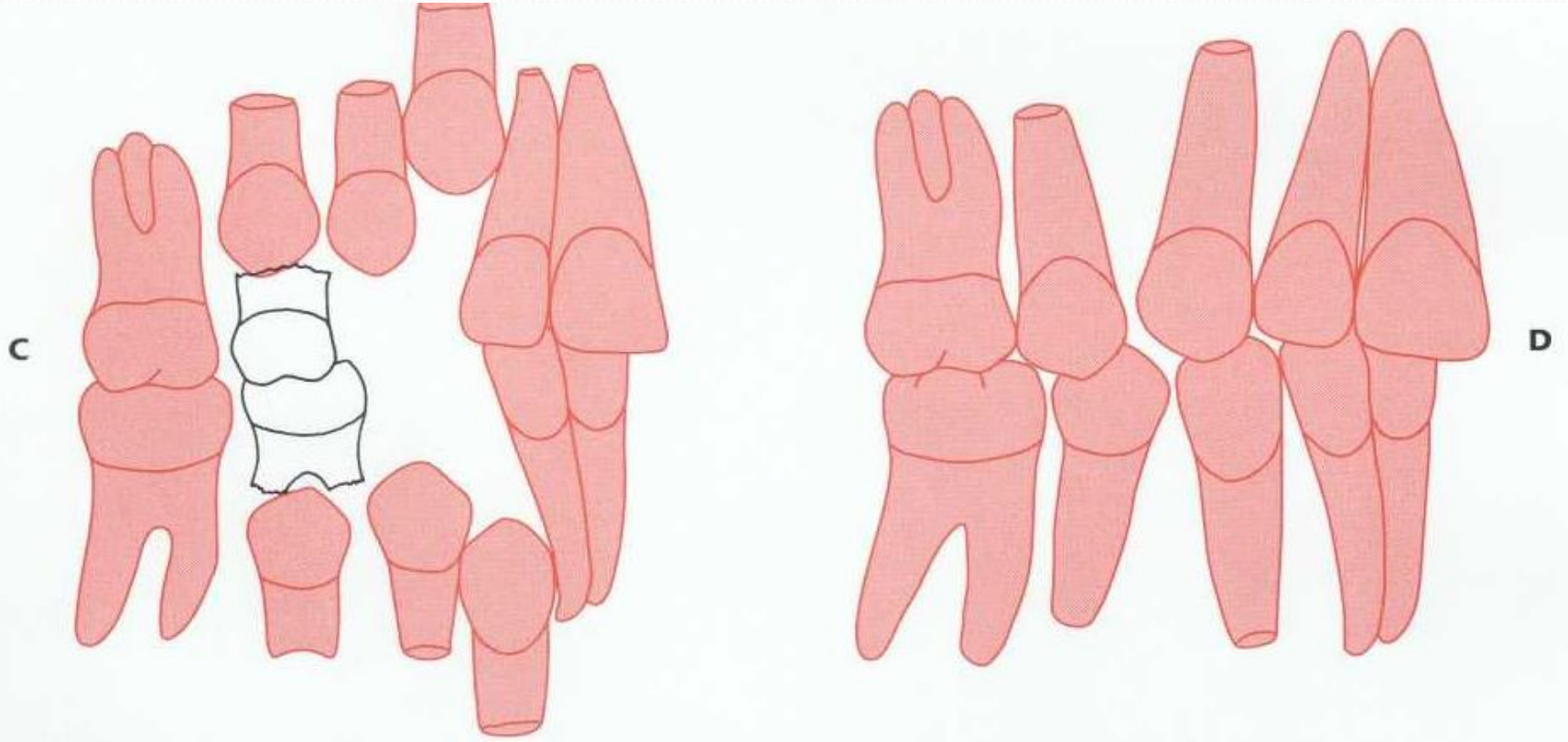
Procedure…

Extraction of Ds, and this is done after an accepted alignment of the incisors.

The aim of these extractions is to accelerate the eruption of the permanent first premolar.



Extraction of permanent first premolar as soon as they emerge from the oral mucosa, thus allowing the space for the canines and 2nd premolars to occupy the space mesial to 6s and distal to 2s.



OTHER VARIATIONS.....

If canine is erupting faster than premolar

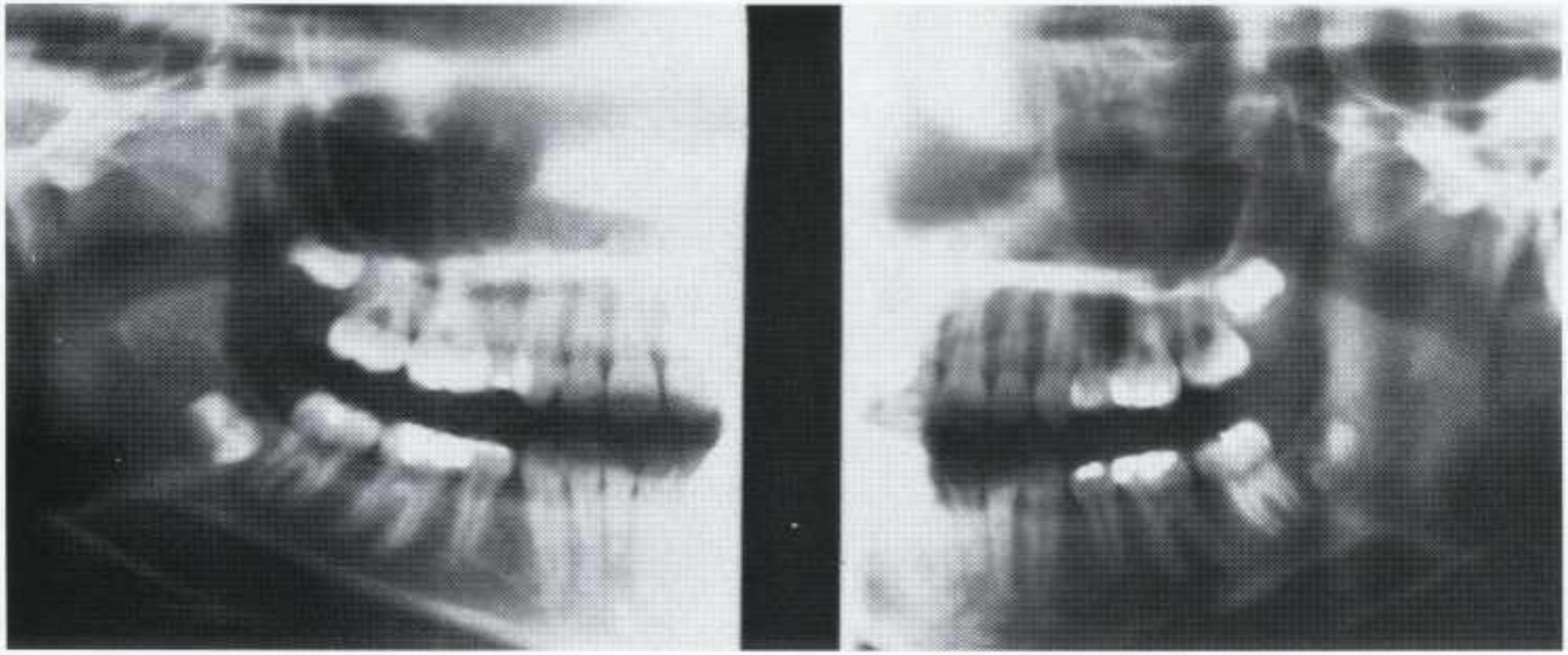
then enucleation of first premolar can be done.

Or extraction of 2nd deciduous molar followed by lingual arch space maintainer

Serial extraction

Serial Extraction

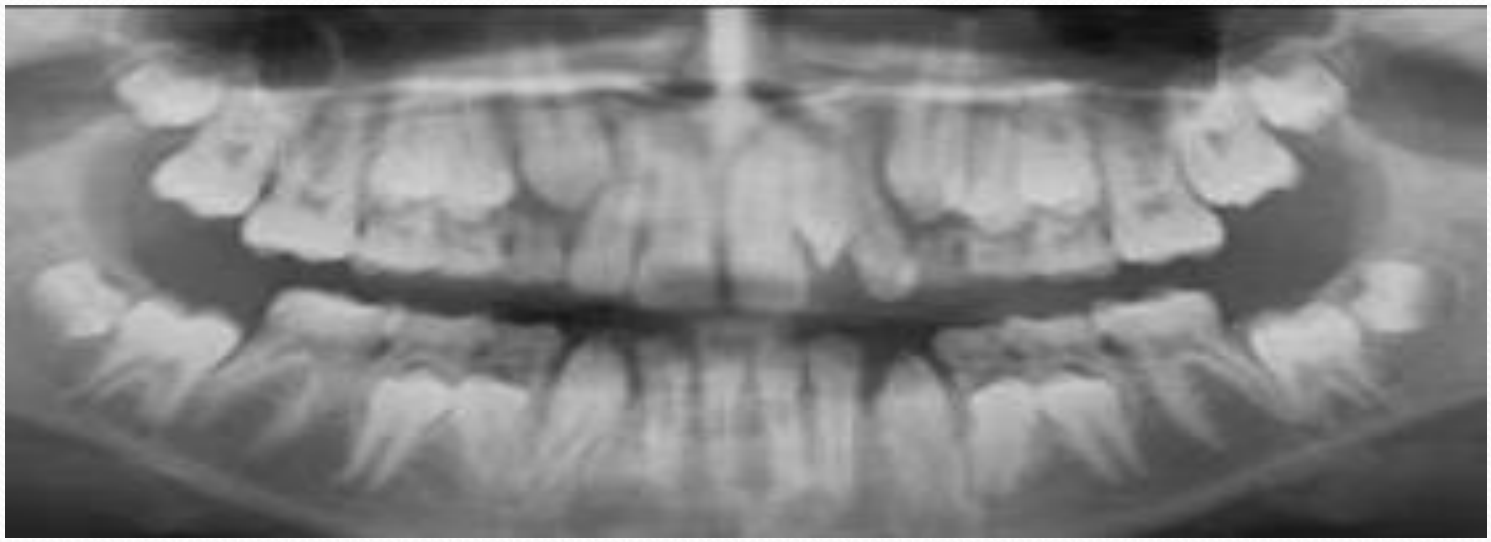
Phase II full braces for alignment, bite and root parallelism.



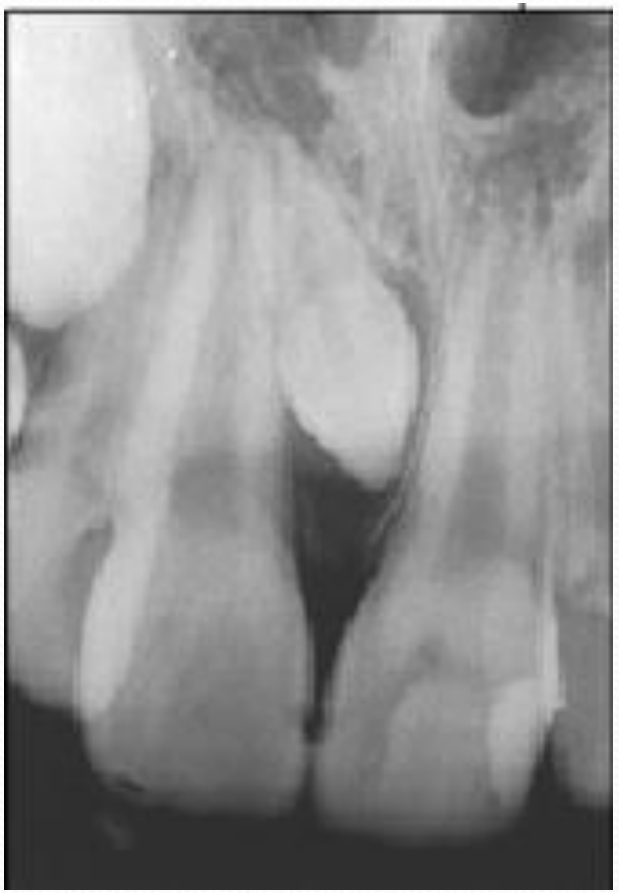
Complications:

I. A complication can occur if the primary first molar is extracted early and the first premolar still does not erupt before the canine. This can lead to impaction of the premolar that requires later surgical removal .
II. Loss of some arch perimeter.
III. Concave profile.
IV. Increase in overbite.
V. Not enough to solve the problem (alone).

- A complete diagnostic aids should be taken before starting the S.E. procedure and the patient should have at least beside clinical examination an OPG that can demonstrate the existence of the complete dentition at the beginning of the treatment.



- All the local factors that worsen the crowding should be avoided during the treatment such as presence of S.N.T, as early loss of primary Es or bad conservative work for the rest of the remaining teeth.



Advantages:

- Immediate relief of crowding or malocclusion.
- Less time consuming and low cost especially if at the end, the teeth arranged with good alignment.
- Simple procedure
- Less duration of wearing orthodontic appliances.

DISADVANTAGES:

- Requires clinical judgment
- Prolonged treatment time(2-3 years)
- Patient compliance(multiple visits)
- Psychological trauma of extraction.

- Possibility of developing tongue thrust
- Arch length reduction
- Ditching between canine and second premolar
- Axial inclination should be corrected later.

To be considered.....

- In a lot of cases the final outcome of teeth alignment are accepted by the parent, patient and even the dentist. However, an upper and lower fixed appliances are needed to give the final touches....
- The appliances are worn for 6-8 months only rather than 2-2.5 years.


Thank
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Class II Malocclusion

Angle's class II the mesiobuccal cusp of the lower first molar occludes distal to the Class I position. This is also known as a postnormal relationship.

class II subdivision a class II molar relation in one side and class I molar in the other side .

Angle's classification was based upon the premise that the first permanent molars erupted into a constant position within the facial skeleton, which could be used to assess the anteroposterior relationship of the arches. In addition to the fact that Angle's classification was based upon an incorrect assumption, the problems experienced in categorizing cases with forward drift or loss of the first permanent molars have resulted in this particular approach being superseded by other classifications. However, Angle's classification is still used to describe molar relationship, and the terms used to describe incisor relationship have been adapted into incisor classification.

- **According to British Standards classification:**

CLASS II DIVISION 1 "The lower incisor edges lie posterior to the cingulum plateau of the upper incisors, there is an increase in overjet and the upper central incisors are usually proclined."

CLASS II DIVISION 2 The lower incisor edges lie posterior to the cingulum plateau of the upper incisors. The upper central incisors are retroclined, because of high lower lip line. Overjet is usually minimal or may be increased."

- ***Von-Der-Linden classified Angle's class II/2 malocclusion in to 3 types based on the severity of incisor relationship :***

Type A: Maxillary central incisors and laterals are retroclined. Degree of retroclination is less severe in nature.

Type B: Maxillary lateral incisors are overlapping the retroclined maxillary central incisors.

Type C : Maxillary central and lateral incisors Are retroclined and are overlapped By the maxillary canines.

Features of Class II Division 1

- Proclined maxillary anteriors with resultant inc overjet.
- Proclined maxillary anteriors with resultant inc overjet.
- Patient exhibits convex profile.
- Having increased overbite & excessive curve of spee.
- Patient exhibits “Liptrap”
- Often lack lipseal.
- Patient exhibits abnormal muscle activity leading to constricted upper arch which predisposes to cross bite.

General clinical features of Class II division 2

Extra-Oral:

-Shape of the head: brachycephalic

-Facial profile: convex (striaght)

-Chin : Prominent

-Lower Lip: Everted (lower lip line is high relative to the upper incisors)

-Upper Lip: Positioned high in respect to the upper anterior (Gummy smile)

-Mentolabial sulcus: Deep

-Mentalis : Hyperactive

- ***Intra-Oral:***

- Class II molar relation (Distocclusion)

- Class II canine relation

- Retroclined maxillary central (extruded)

- Labialy tipped maxillary lateral incisors

- Deep bite: overclosure (closed bite)

- Decreased overjet

- Accentuated curve of Spee

- Retroclined lower incisors

(Extruded → lack of stops)

AETIOLOGY

- ***SKELETAL PATTERN***
- ***HABITS***
- ***SOFT TISSUES***
- ***DENTAL FACTORS***

Skeletal Class II malocclusion Results from a discrepancy in the maxillary-mandibular skeletal relationship. It might be either due to:

1) Mandibular deficiency

2) Maxillary excess

3) or a combination of both

Skeletal Class II → Mandibular deficiencyIt is a skeletal class II relationship resulting from a mandible that is either small or retruded relative to the maxilla.

- ***Mandibular deficiency due to small size of ramus and body of mandible. This results in a downward or backward rotation of mandible and this result in:***

Cephalometric Features

**** Decreased posterior facial height.***

**** Steeper mandibular plane angle.***

**** A normal SNA angle.***

**** Decreased SNB angle.***

**** Inceased ANB angle.***

**** Increased angle of convexity.***

**** Normal position of point A but a posterior positions of point B relative to Nasion perpendicular.***

**** It is common in a sever mandibular deficiency to have dental compensation for the skeletal disproportion displayed cephalometrically as protruded lower incisors (increased angulation of mandibular incisors relative to mandibular plane on Frankfort horizontal.***

- ***Class II div 2 with a small mandible→the decreased size is localized more to the mandibular body (Mandibular Ramus is of normal lenght)***

Cephalometrically:

1) Flat mandibular plane

2) Increasesd posterior facial height

3) Short lower anterior facial height

(resulting in both upper and lower lip having a more everted position at rest)

4) Mandibular length measured from Ar-Gn-Pog may appear normal because of the excessive chin projection.

5) SNA: normal , SNB: decreased , ANB: increased (Stiener)

- ***Mandibular deficiency may result from the retrusion (distal positioning) of a normal-sized mandible.***

Cephalometrically:

SNA: Normal , SNB: Decreased ,ANB: Increased (Stiener)

-Distinguishing characteristics:

a)The cranial base defined by (S-N-Basion) is more obtuse

b)Gleniod fossa in a relatively posterior in position.

c)Normal size of mandibular ramus and body

d) normal lower facial height

Skeletal Class II → Maxillary excess

1. ***Vertical dimension (Posterior excess ,0r Overall vertical excess)***
2. ***or Anterior-posterior dimension***
3. ***(Combination of both)***

- Vertical Maxillary excess may be localized only to the posterior area → Open bite and incompetent lips (normal vertical display of maxillary incisors in repose and during smiling.)

- Overall maxillary excess includes both the anterior and the posterior area → resulting in an excessive vertical display of the maxillary incisors in repose and during smiling (high smile line)→ Gummy smile.

- In these 2 conditions of maxillary excess→ Mandible is rotated downward and posteriorly (clockwise)→ resulting in a class II skeletal relationship.

- ***Class II with an overall vertical maxillary excess:***

Cephalometrically:

-SNA: Normal , -SNB: Decreased , -ANB: Increased (Stiener)

-Increased lower anterior facial height

-Steeper mandibular plane

-More inferior position of the maxillary molars relative to palatal plane.

-Clockwise rotation of the mandible

- ***Maxillary excess in Ant-Post Dimension is characterized by a protrusion of the entire midface including :***

    1. **Nose**
    2. **infraorbital area**
    3. **Upper lip**

Cephalometrically:

SNA: increased , SNB: Normal , ANB: Increased

-Increased face convexity. -Overjet: excessive

-Over eruption of mandibular incisors -Excessive overbite.

--If midface protrusion is severe →The lower lip will be positioned lingual to maxillary incisors encouraging there protrusion.

- **Skeletal Class II might be a combination of both mandibular deficiency and maxillary excess. Which will add to the severity of the Ant-post skeletal problem.**

- ***SOFT TISSUES FACTORS :- Influence of soft tissue is mainly mediated by skeletal pattern both antero-posteriorly & vertically.***

  - ***In a Class II division 1 malocclusion the lips are typically incompetent owing to the prominence of the upper incisors and/or the underlying skeletal pattern. If the lips are incompetent,***
  - ***Patient's try to achieve anterior oral seal in one of the following ways:***
    - ***Circumoral muscular activity.***
    - ***Forward postured mandible.***
    - ***Lower lip is drawn up behind the upper incisors.***
    - ***Tongue is placed forward between incisors to contact lower lip.***
    - ***Combination of these***

Where the patient can achieve lip-to-lip contact by circumoral muscle activity or the mandible is postured forwards, the influence of the soft tissues is often to moderate the effect of the underlying skeletal pattern by dento-alveolar compensation.

More commonly the lower lip functions by being drawn up behind the upper incisors, which leads to retroclination of the lower labial segment and/or proclination of the upper incisors with the result that the incisor relationship is more severe than the underlying skeletal pattern.

If the lower facial height is reduced

- ***A high lower lip line will tend to retrocline the upper incisors.***
- ***Class II division 2 incisor relationships may also result from bimaxillary retroclination caused by active muscular lips irrespective of the skeletal pattern..***

- ***HABITS FACTORS digit sucking lead to :-***
  - ***Proclination of the upper incisors.***
  - ***Retroclination of the lower labial segment.***
  - ***Incomplete overbite or localized anterior open bite.***
  - ***Narrowing of maxillary arch,Due to alteration in the balance between cheek & tongue pressure***

❖ ***Dental factors: The causes of dental Class II malocclusions can be subdivided into two groups:***

1- Maxillary dental protrusion

Maxillary dental protrusion may be confused with anteroposterior maxillary excess or midface protrusion, maxillary dental protrusion is not a skeletal problem but a dentoalveolar one that is limited to the maxillary dental arch. The facial appearance of anteroposterior maxillary excess is a protrusion of the entire midface, whereas maxillary dental protrusion only affects the lips. Excessive overjet is a reliable feature of this dental malocclusion, and there may be generalized maxillary spacing.

2- Mesial drift of the maxillary first permanent molars.

Mesial and occlusal drift of the permanent first molars occurs if there is loss of mesial proximal contact with the second primary molars from congenital absence, extraction, dental caries or ankylosis.

Ectopic molar eruption, if left untreated, the maxillary first permanent molar assumes a more mesial position, resulting in a Class II permanent molar relationship if the mandibular arch is unaffected .

○ *Factors influencing a definitive treatment plan*

1-**Severity of malocclusion**

- The skeletal pattern is the major determinant of the difficulty of treatment.
- Those cases with a marked anteroposterior discrepancy and/ or significantly increased or reduced vertical skeletal proportions will require careful evaluation, an experienced orthodontist, and possibly surgery for a successful result

2) Age of the patient **Timing of the treatment:** is an important factor in the amount of change that can be produced

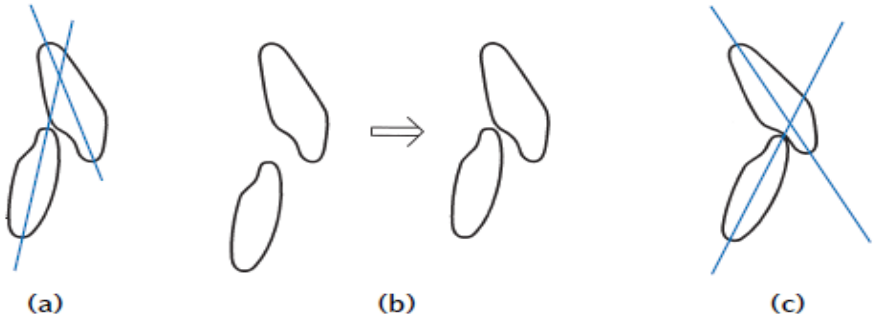
- Optimum time for growth modification→ Pre-pubertal growth spurt
- therefore proper diagnosis of the patient at early age and the use of correct functional appliances will cause the patient to → aviod surgery

3-The patient's facial appearance

- For example, in a case with a Class II skeletal pattern due to a retrusive mandible, a functional appliance may be preferable to distal movement of the upper buccal segments with headgear.
- The profile may also influence the decision whether or not to relieve mild crowding by extractions.
- Features include an obtuse nasolabial angle or excessive upper incisor show a surgical approach may be preferred

4-The likely stability of overjet reduction

- The soft tissues are the major determinant of stability following overjet reduction
- **Ideally, at the end of overjet reduction the lower lip should act on the incisal one-third of the upper incisors and be able to achieve a competent lip seal.**
- If this is not possible, consideration should be given as to whether treatment is necessary (if alignment is acceptable and the overjet is not significantly increased) and, if indicated, whether prolonged retention or even surgery is required.



If a Class II division 2 incisor relationship is to be corrected not only the overbite but also the inter-incisal angle must be reduced to prevent re-eruption of the incisors post-treatment: (a) Class II division 2 incisor relationship; (b) reduction of the overbite alone will not be stable as the incisors will re-erupt following removal of appliances; (c) reduction of the inter-incisal angle in conjunction with reduction of the overbite has a greater chance of stability.

The inter-incisal angle in a Class II division 2 malocclusion can be reduced in a number of ways:

- Torquing the incisor roots palatally/lingually with a fixed appliance
- Proclination of the lower labial segment. This approach should only be employed by the experienced practitioner as, although it provides additional space for alignment of the lower incisor teeth, any excessive movement of the lower arch would increase the risk of relapse.
- Proclination of the upper labial segment followed by use of a functional appliance to reduce the resultant overjet and achieve intermaxillary correction.
- A combination of the above approaches.
- Orthognathic surgery. This approach may be the only alternative for patients with a marked Class II skeletal pattern and/or reduced vertical skeletal proportions.

Treatment of Class II

- **Class II malocclusion → Dental or Skeletal**

Dental Class II → Orthodontic treatment (extraction or non extraction)

Skeletal Class II →

1) Growth modification (Growing patient)

2) Dental camouflage (extraction vs non extraction)

(mild to moderate skeletal class II)

3) Orthognathic surgey + with orthodontic treatment

(moderate to severe Class II)

For a dental Class II malocclusion:

Extraction or non-extraction treatment.→ depending on the severity of mesial drift of the maxillary 1st molar.

-slight mesial drift (mesial crown tipping) + minimal crowding → Nonextraction + distalization of maxillary 1st molar

- severe mesial drift (roots and crown are mesially positioned) → extraction is indicated to obtain space**.**

Treatment of skeletal Class II malocclusion

- **Growth modification for class II skeletal problem: (Orthopedic treatment)**

- the goal of growth modification is to enhance the unacceptable skeletal relationship by modifying remaining facial growth pattern of the jaws.

- Optimum timing : Pre-pubertal growth spurt *(active growth period)*

Type :- I) Headgear (extra-oral force)

2) Functional appliances (Removable and fixed)

- Headgear:

it delivers an extra-oral orthopedic force to compress the maxillary sutures and modify the pattern of bone apposition at these sites as well as distalize the maxillary dentition or maxilla itself. It derives the anchorage from cervical or cranial regions.

The goal of treatment is to restrict the maxillary growth, while the mandible continues to grow forward to forward to “catch up” the maxilla

Components of Head gear:

-1) Face bow:- It is a metallic component that helps in transmitting extra oral forces on to the posterior teeth. It consists of outer bow, inner bow & junction.

2) Force element:- It provides the force to bring about desired effect comprises of springs, elastics & stretchable materials.

3) Head cap or Cervical strap:- The appliance takes anchorage by means of head cap or cervical strap.

- Functional appliances: Class II functional appliances are designed to position the mandible in a downward and forward to enhance its mandibular growth pattern.
- Indication: Mandibular deficiency

Removable Functional:	**Fixed Functional:**
-Activator	-Herbst
- Bionator	-Jasper jumper
-Twin blocK	
- Frankyl II	

Dental Camouflage:

- It is a treatment that seeks to create a dental compensation to hide the skeletal discrepancy → Maxillary Retroclination and Mandibular Protraction.
- ***Indicated:***

1. Adults
2. Mild to Moderate skeletal Class II cases
3. Minimal dental crowding .
4. Acceptable facial esthetics
5. Usually requires extraction

Orthognathic surgery:

- A combination of orthodontic therapy and Orthognathic surgery for the correction of moderate to severe skeletal class II malocclusion *(Adults, no growth potential)*

  - Indicated:

    1) Moderate to Severe skeletal discrepancy
    2) Facial imbalances or asymmetries: long lower face , Gummy smile
    3) Limitations of tooth movement : Upright on basal bone
    4) Relapse potential of orthodontic treatment.
    5) Severe crowding and protrusion in the dental arches with skeletal class II malocclusion (extraction space is not sufficient to correct buccal occlusion)

  - Surgical correction includes:

1) Mandibular Advancment: skeletal class II cases with mandibular deficiency

The intraoral sagittal split ramus osteotomy is the most popular technique for surgical mandibular advancment.

2)Maxillary Impaction: (Le Fort 1 maxillary osteotomy)

Indicated: Vertical Maxillary excess ,

Vertical maxillary excess in the anterior and posterior region of maxilla

→ Requires maxillary impaction by a total maxillary ostoetomy .

To correct the:

1) Gummy smile
2) Excessive lower facial height
3) Incompetent lips
4) Mandible will rotate anti-clock wise

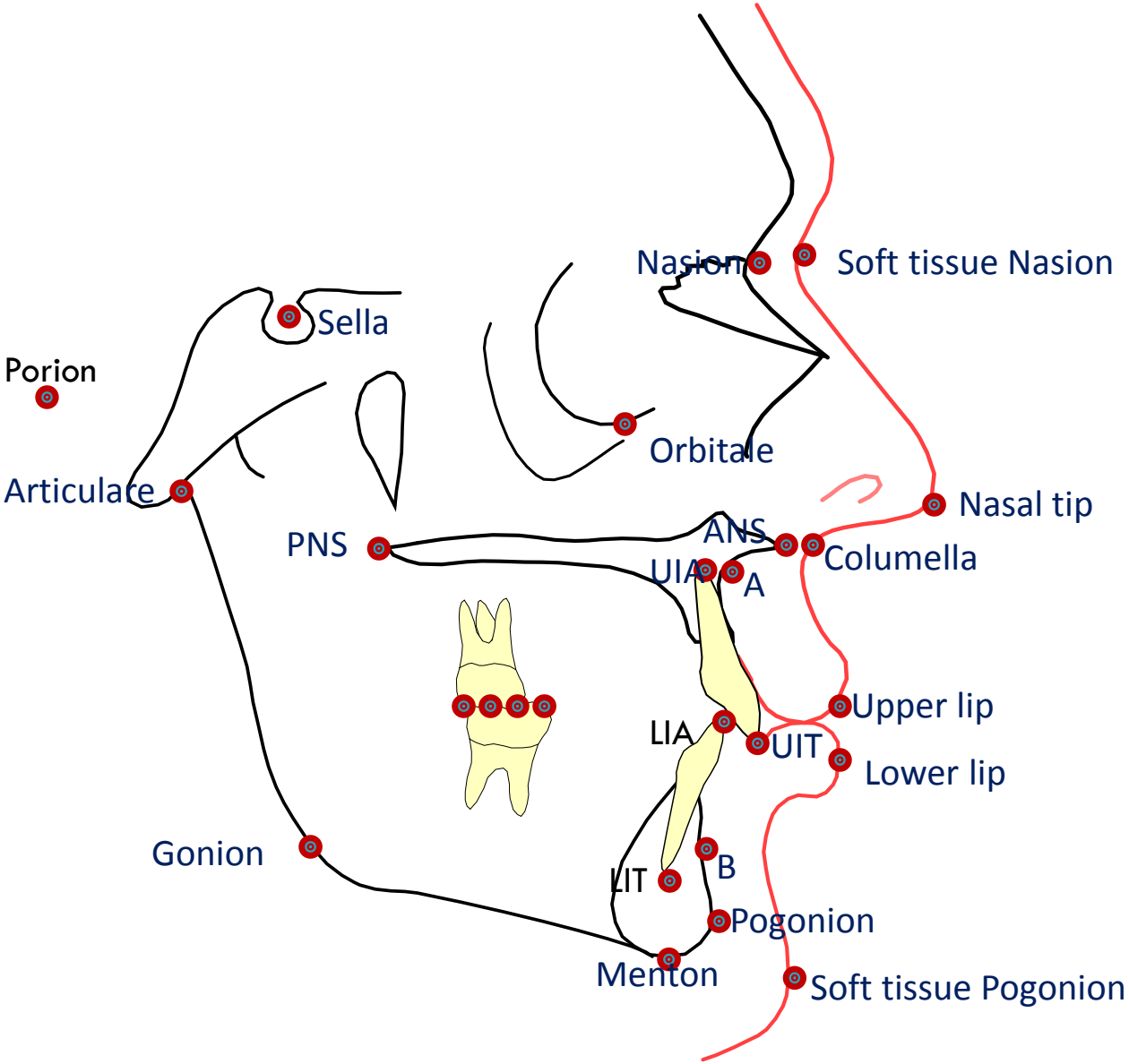
3)Anterior Maxillary sub-apical setback

Indicated: Maxillary excess is in A-P dimension/ Mid-face protrusion (No vertical excess)

- **Combined Surgical approaches :**

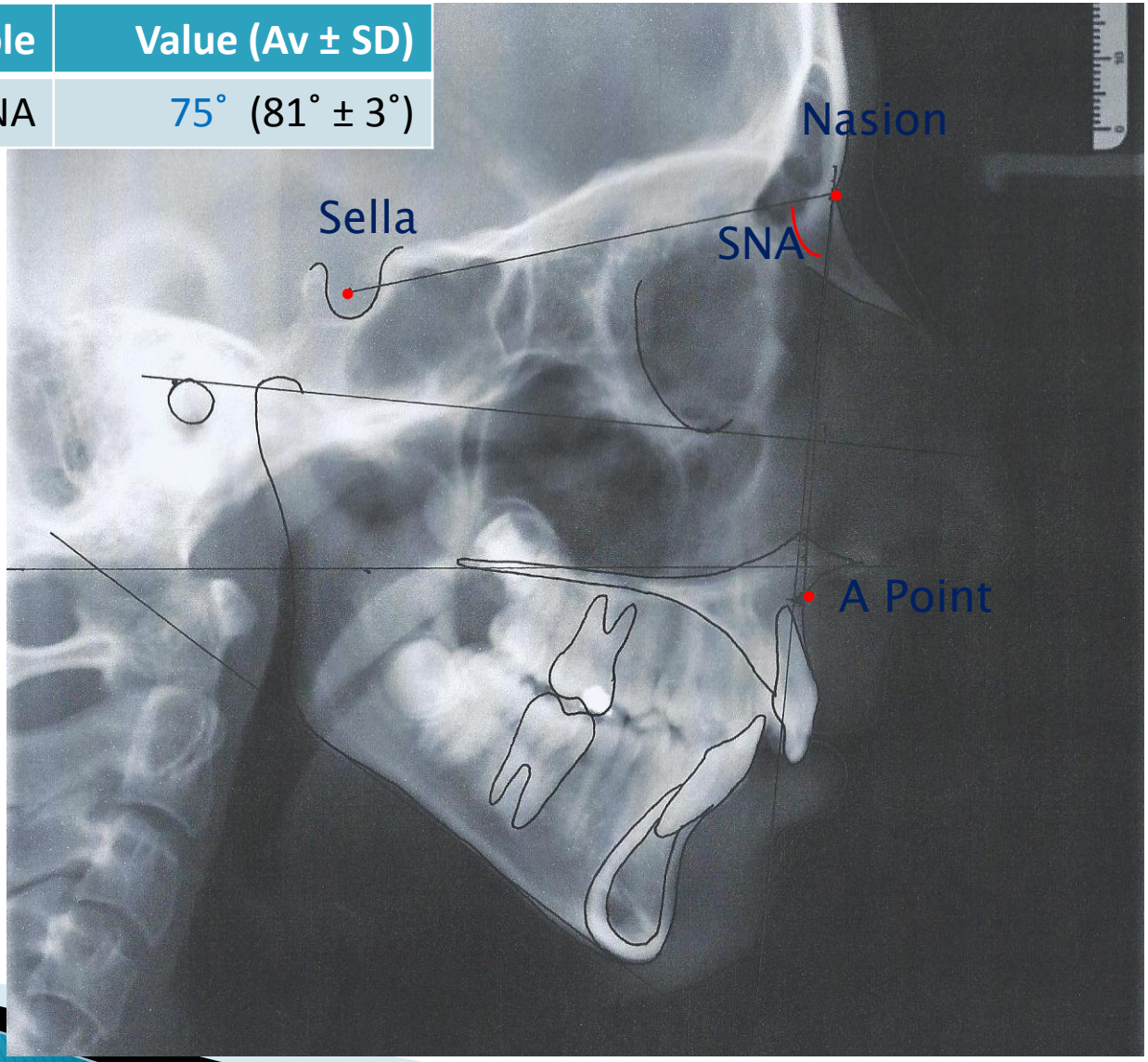
Indicated: Maxillary excess (vertical or A-P) combined with mandibular deficiency.

Cephalometry


Nasion
Soft tissue Nasion
Sella
Porion
Orbitale
Articulare
Nasal tip
ANS
PNS
Columella
UIA
A
Upper lip
LIA
UIT
Lower lip
Gonion
B
LIT
Pogonion
Menton
Soft tissue Pogonion

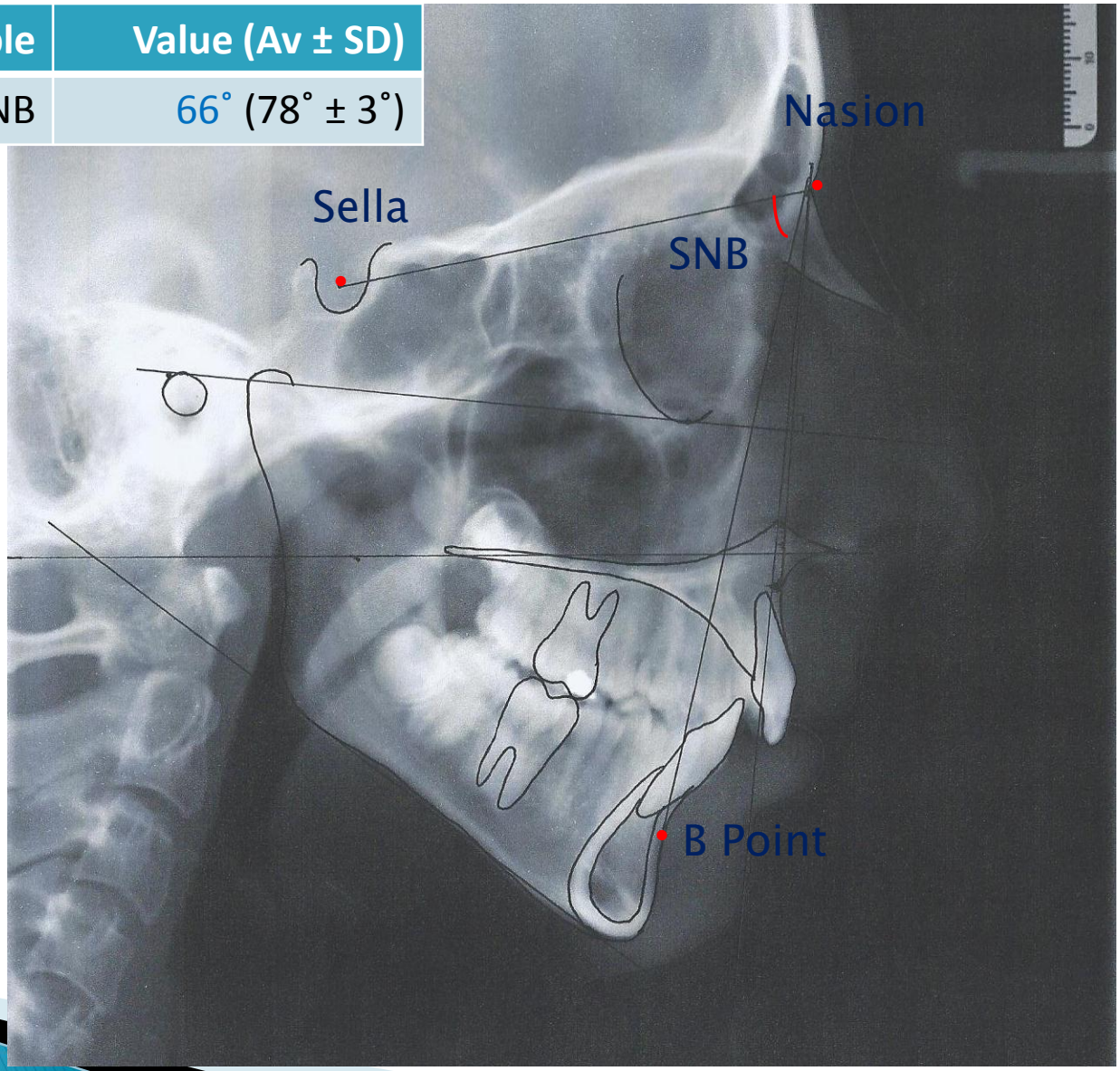
AP: SNA

Variable	Value (Av ± SD)
SNA	75˚ (81˚ ± 3˚)



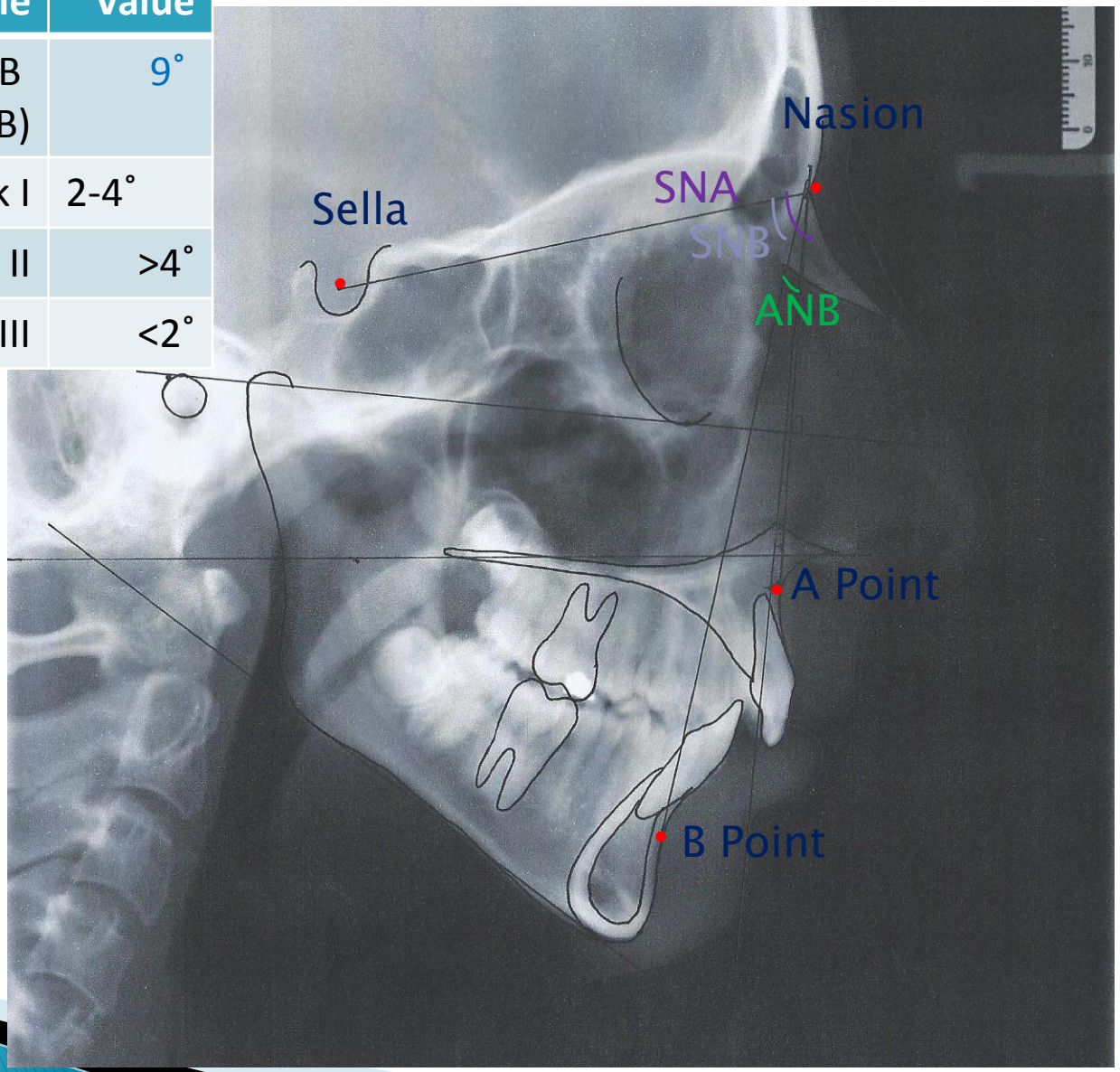
AP Analyses: SNB

Variable	Value (Av ± SD)
SNB	66° (78° ± 3°)

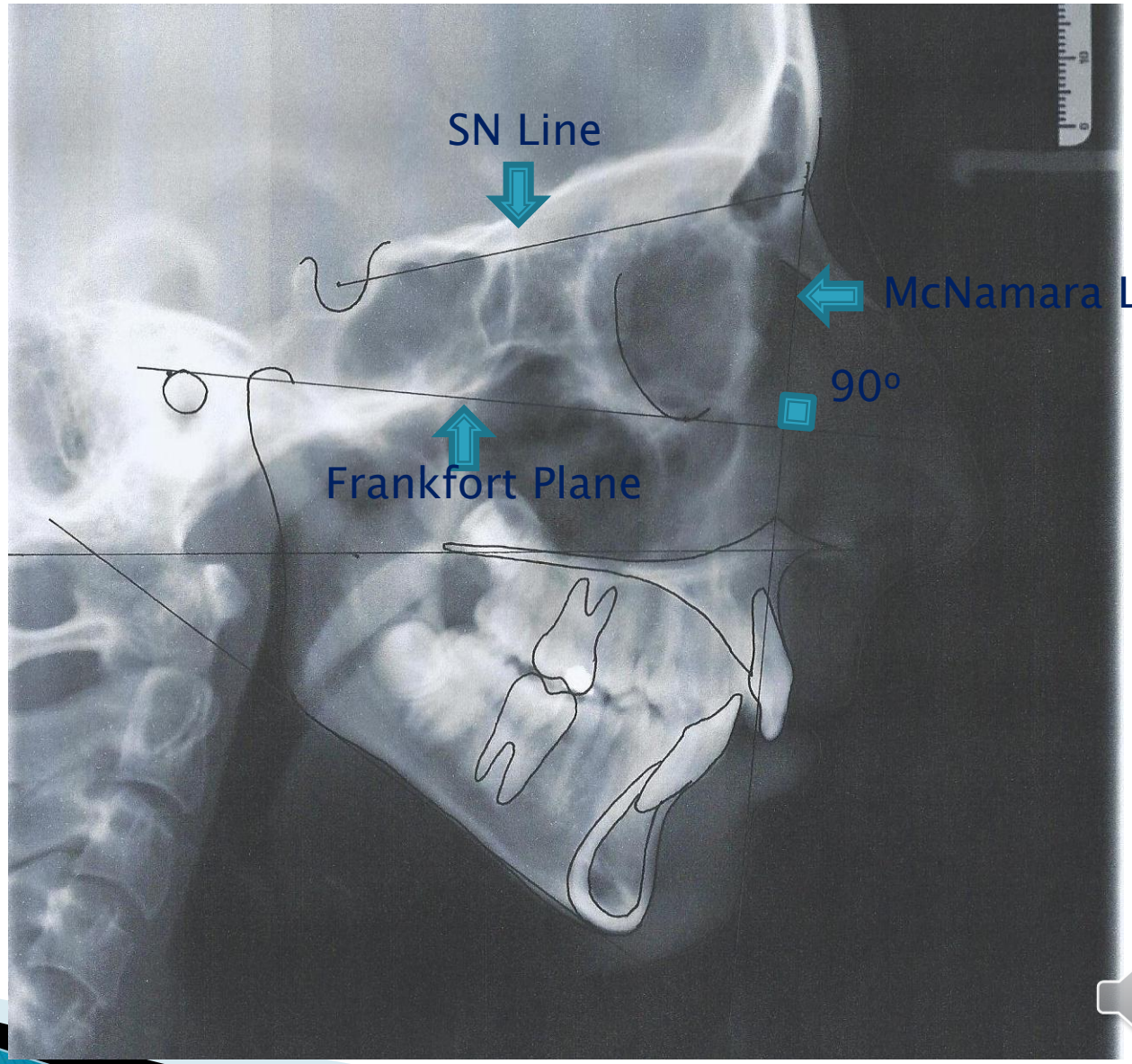


AP Analyses: ANB

Variable	Value
ANB (SNA-SNB)	9˚
Sk I	2-4˚
Sk II	>4˚
Sk III	<2˚

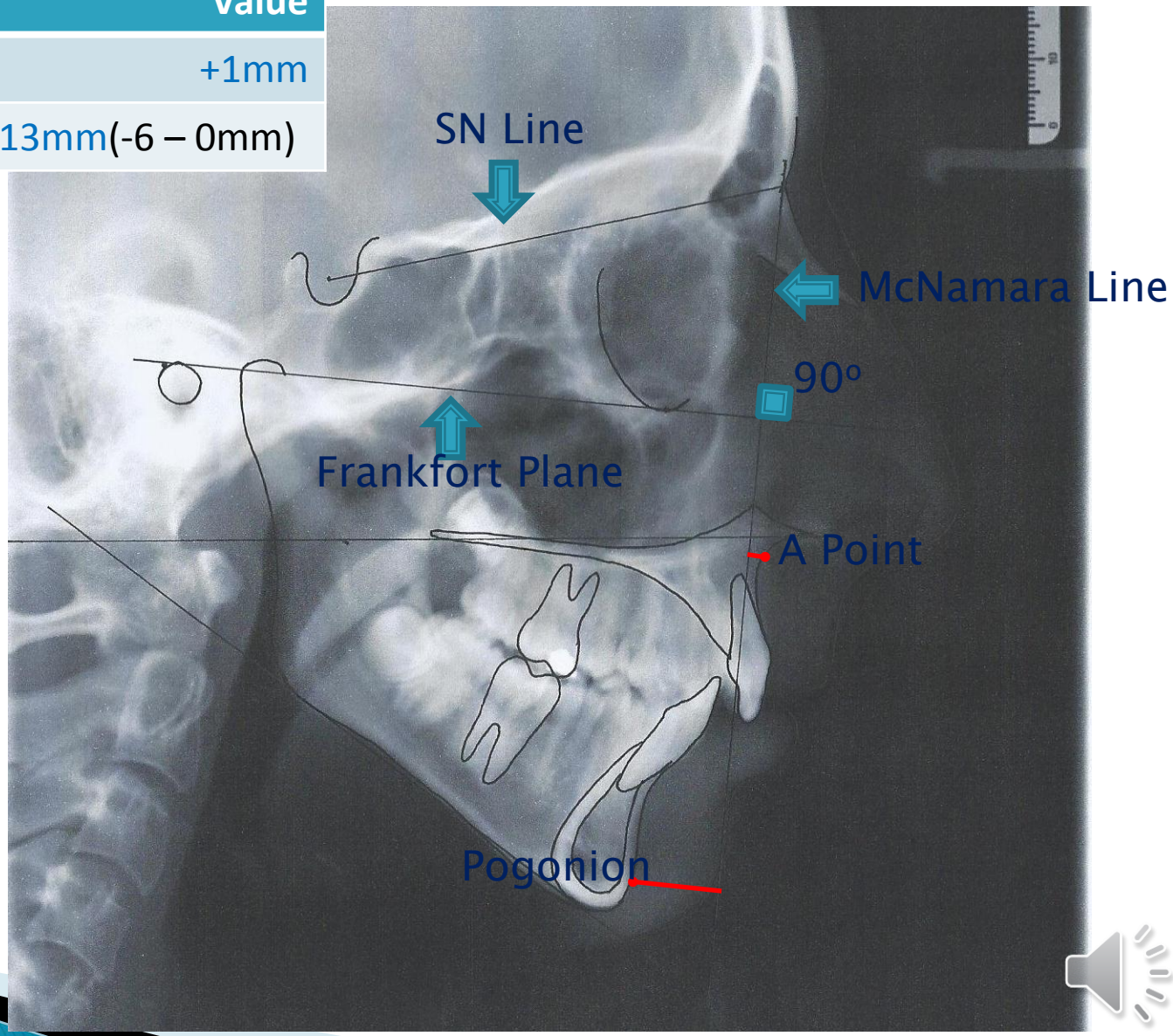


McNamara Line



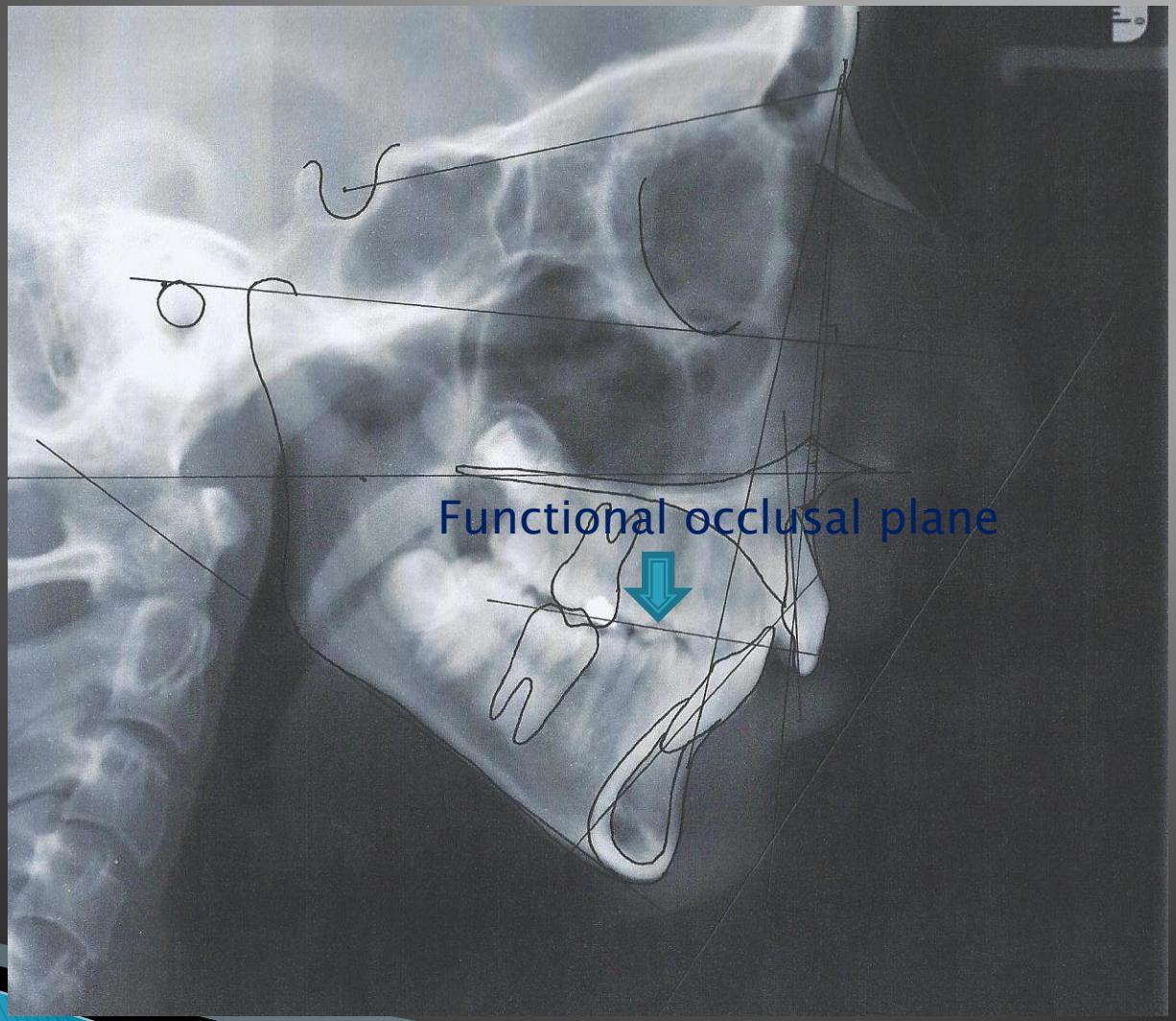
AP: McNamara Analysis

Variable	Value
Mc-A	+1mm
Mc-Po	-13mm(-6 – 0mm)



Functional occlusal plane

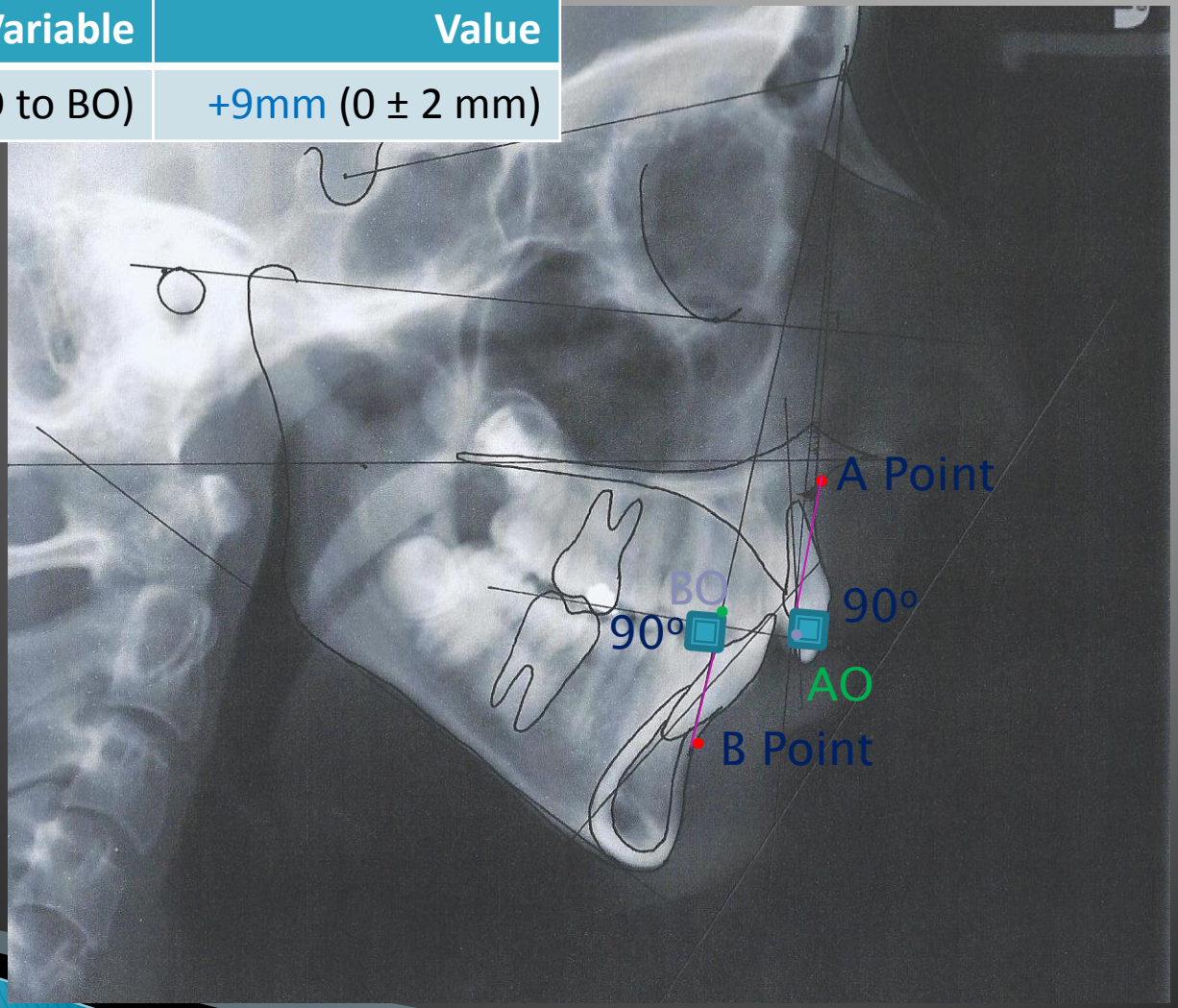
The functional occlusal plane is constructed from a line through the upper and lower molars and premolars



AP: Wits Analysis

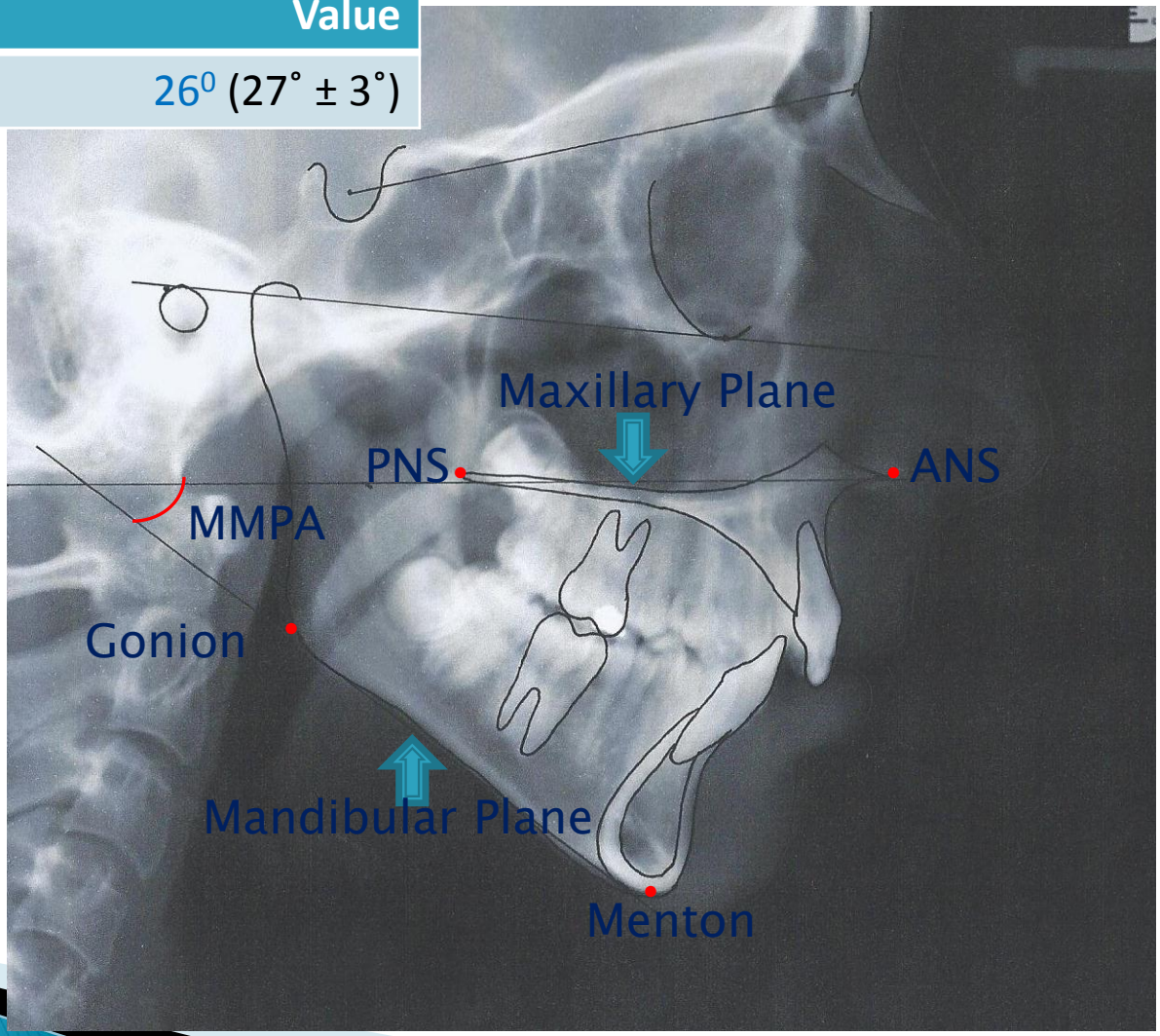
Draw vertical lines from A and B point, which are perpendicular to the functional occlusal plane.

Variable	Value
Wits (AO to BO)	+9mm (0 ± 2 mm)



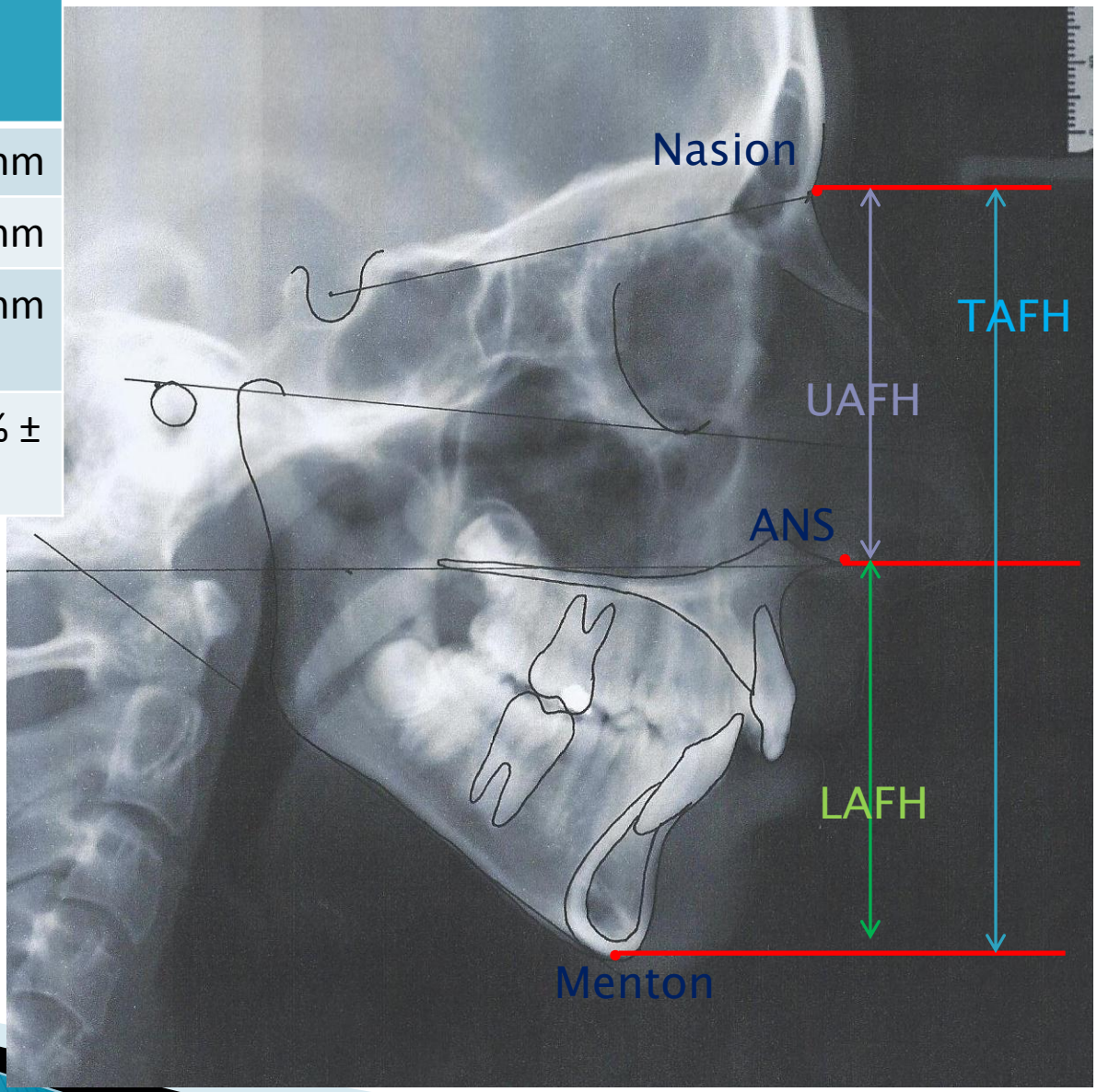
Vertical: Maxillary Mandibular Planes Angle (MMPA)

Variable	Value
MMPA	26^0 (27˚ ± 3˚)



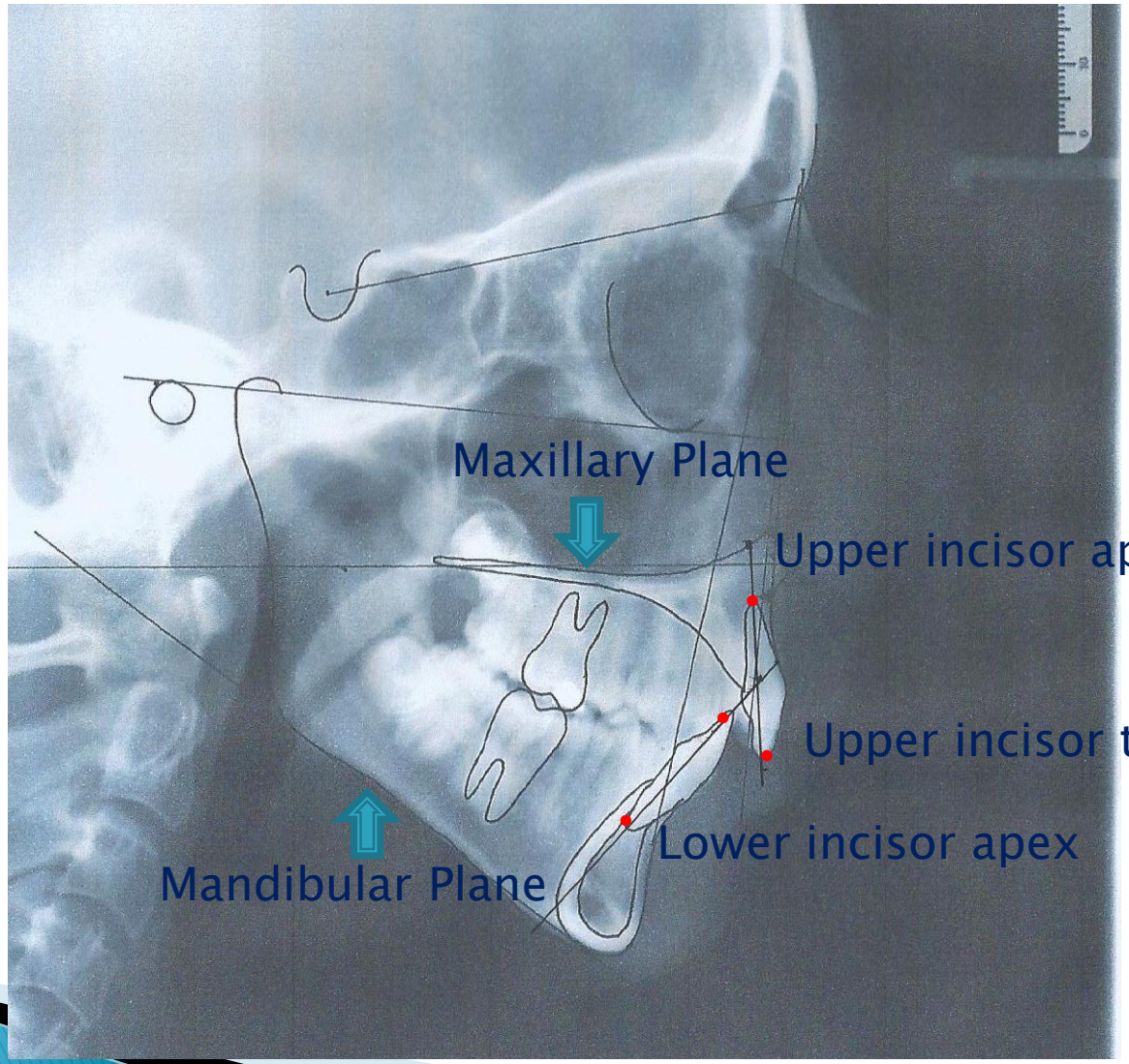
Vertical: Anterior Face Height

Variable	Value (Av ± SD)
LAFH	61mm
UAFH	52mm
TAFH (LAFH + TAFH)	113mm
LAFH / TAFH	54% (55% ± 2%)



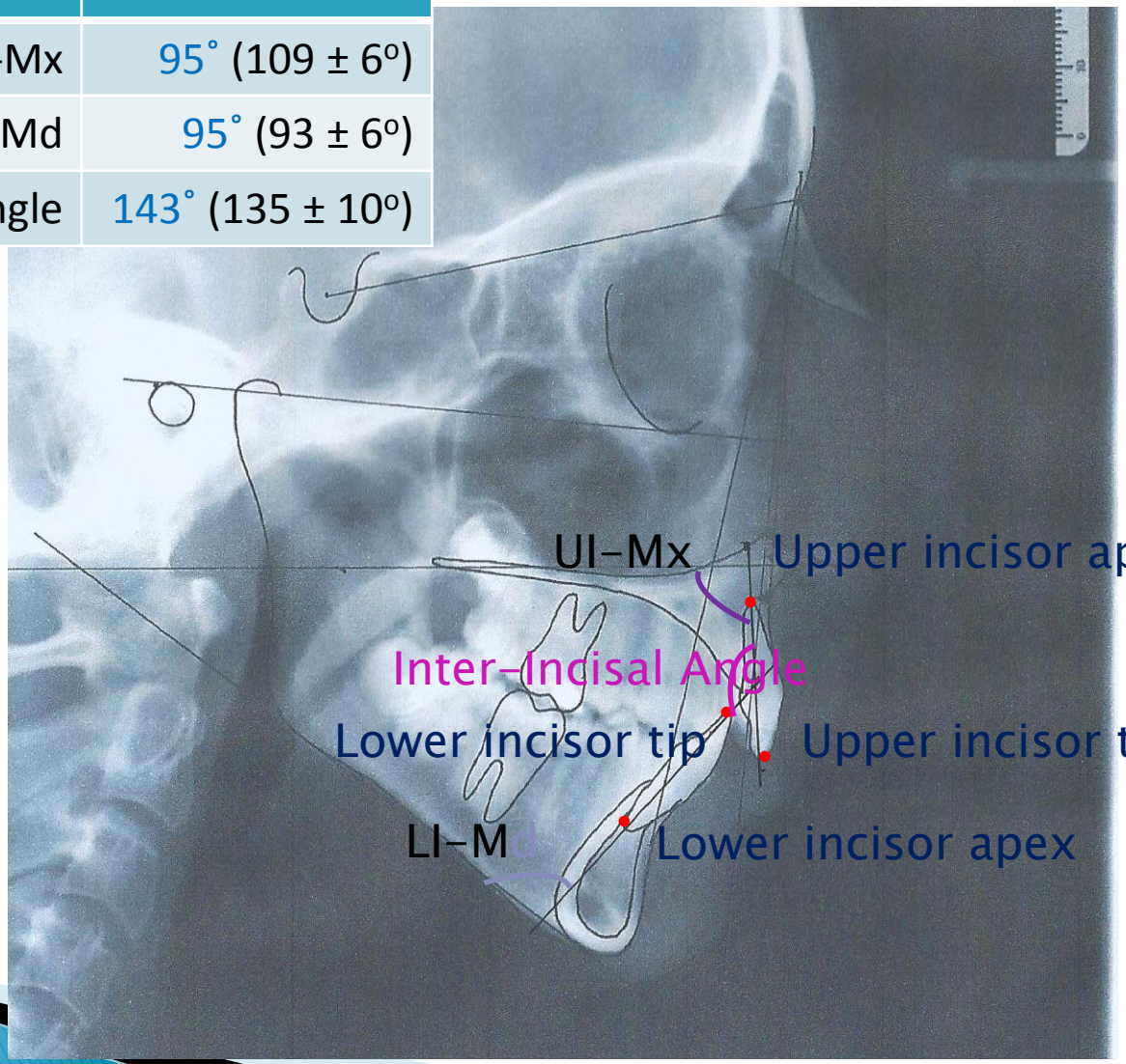
Dental Analysis

Incisor inclination



Incisor inclination

Variable	Value (Av ± SD)
UI-Mx	95˚ (109 ± 6º)
LI-Md	95˚ (93 ± 6º)
II angle	143˚ (135 ± 10º)



Incisor inclination

Variable	Value (Av ± SD)
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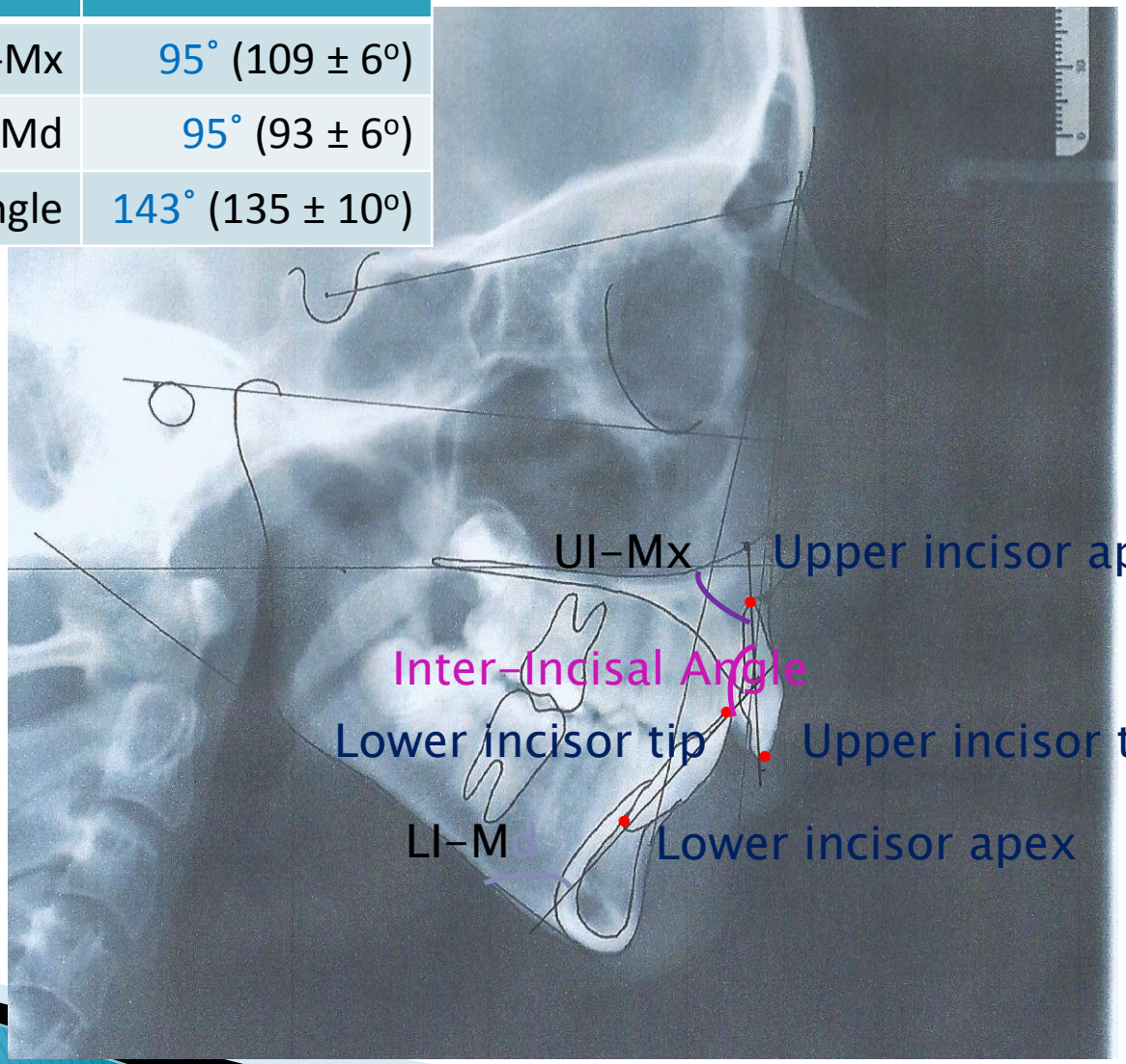
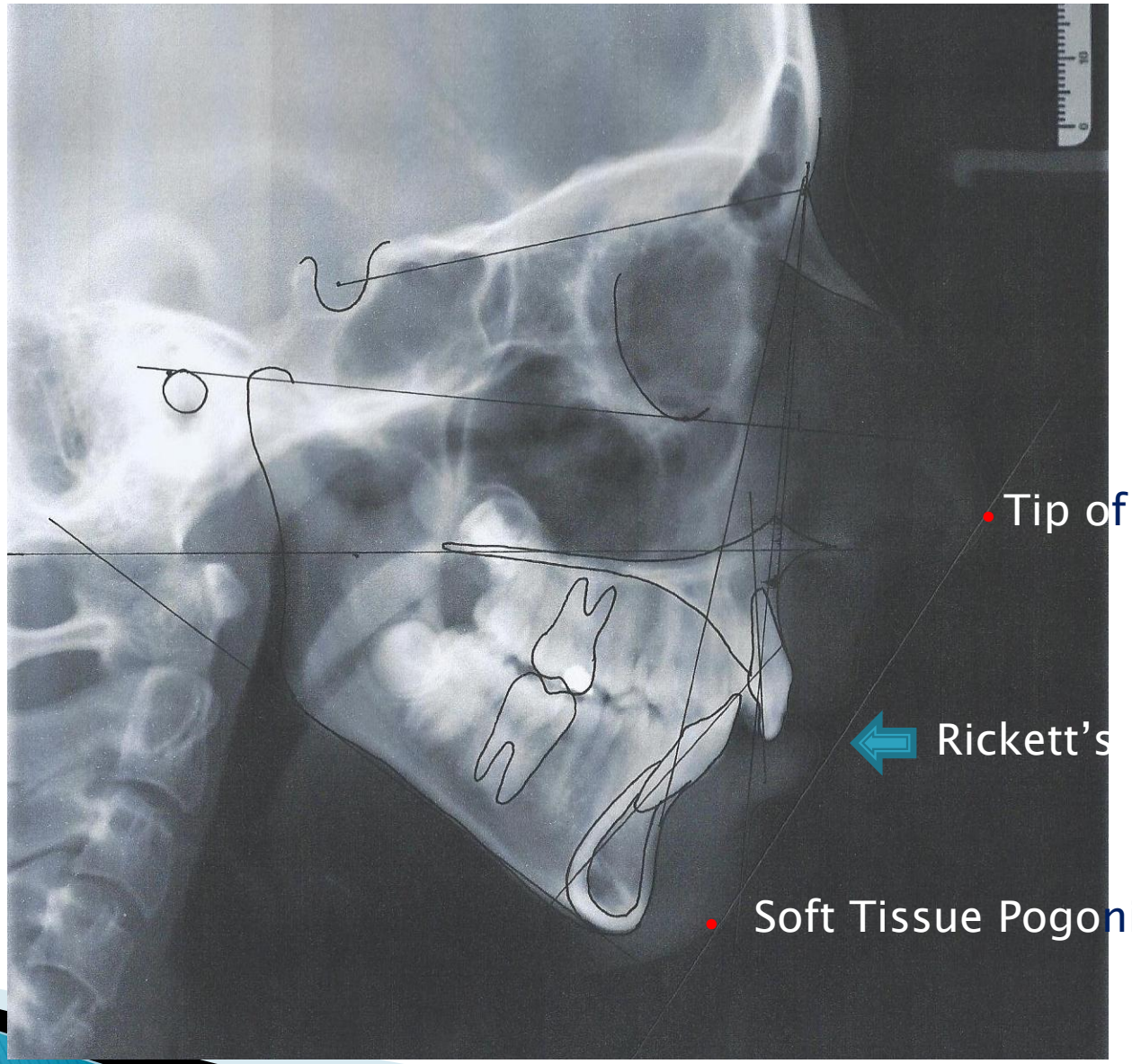
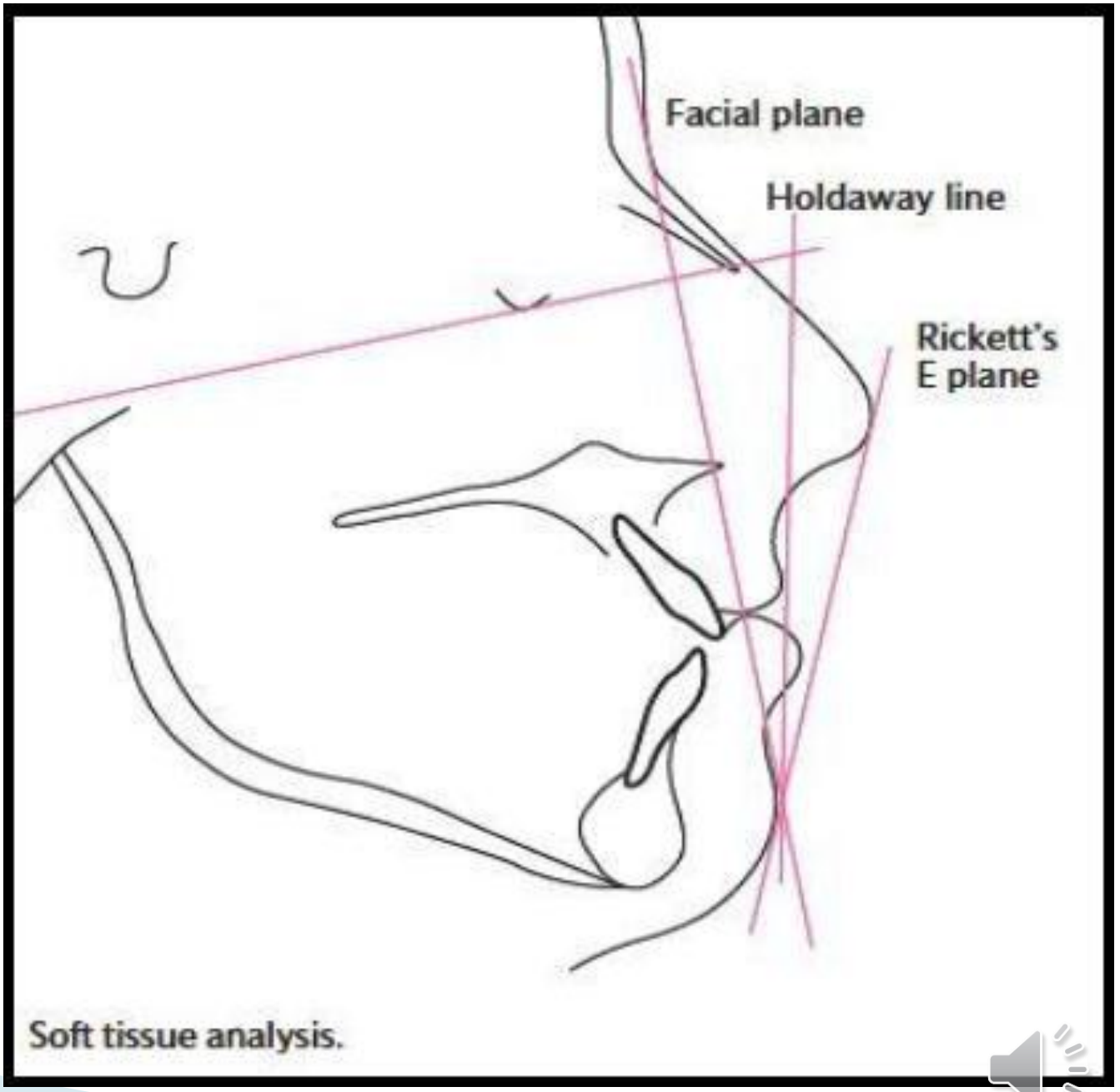


Soft Tissue Analysis

Rickett's E(aesthetic) Line





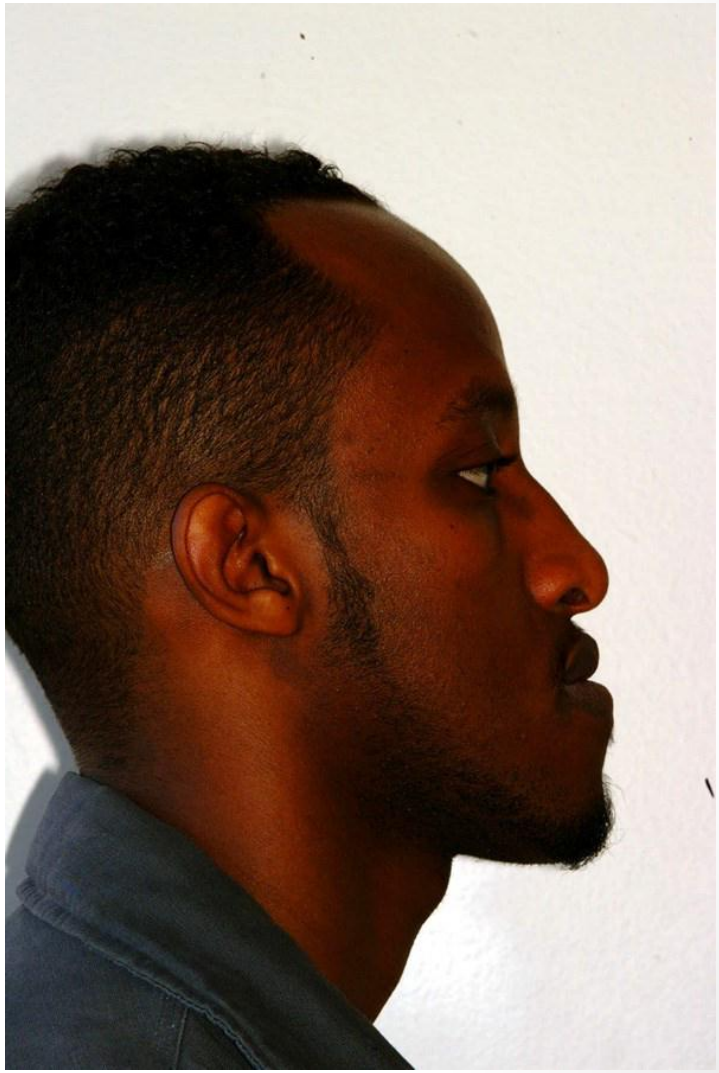
Soft tissue analysis.

Class III Malocclusion

Objectives:

To define a Class III dental and skeletal relationship
To describe the aetiological factors which give rise to this malocclusion
To describe the timing of treatment
To describe the methods of treatment available

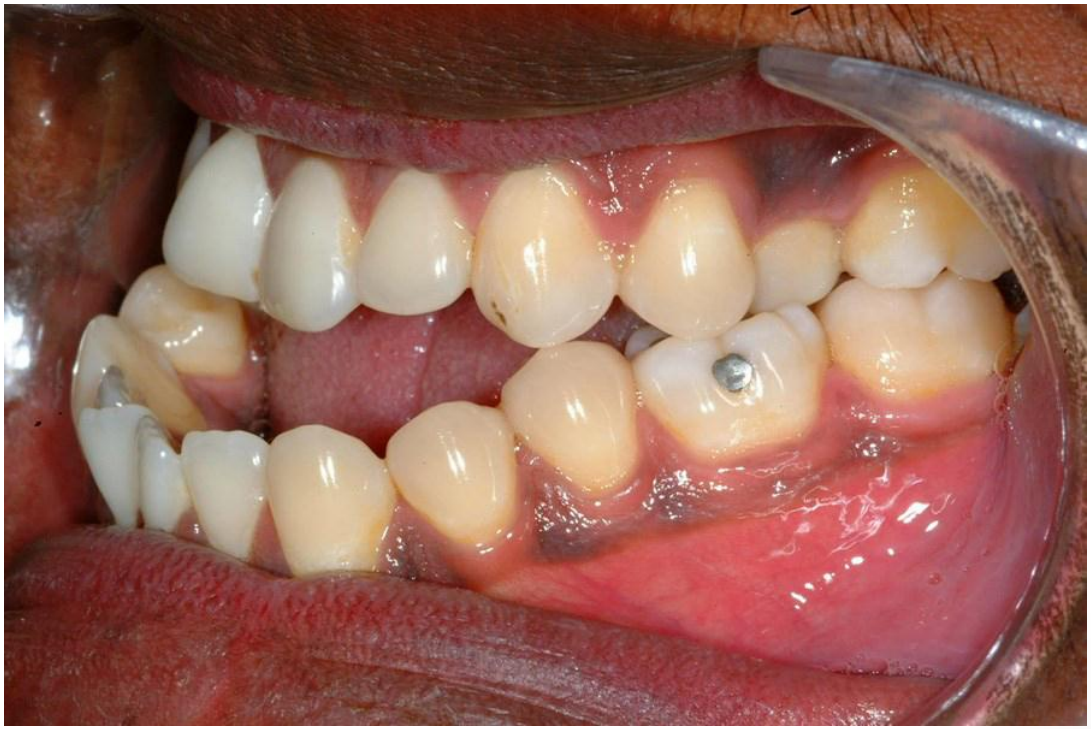
- Definition
- Class III
- Skeletal pattern
- Incisal relationship
- Molar relationship



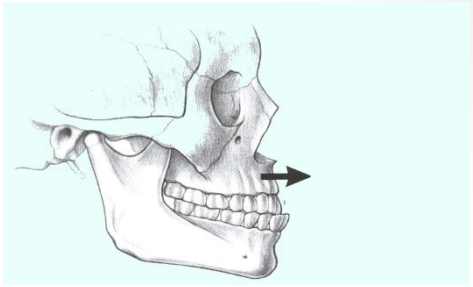
Definition:
Incisal
The lower incisal edge meets anterior to the cingulum plateau of the palatal surface of the upper incisors

Definition:

Molar
The upper molar is distal to the mesiobuccal cusp of the lower molar.



Aetiology
Skeletal
Soft tissue
Dentoalveolar
other



ETIOLOGY True Class III malocclusion exhibits(Underlying skeletal imbalance) usually inherited and has a very strong GENETIC basis.

Habitual, forward positioning of the mandible
(Pseudo Class III) for example Occlusal prematurities, Enlarged adenoids .**Pseudo Class III** Ceph values intermediate between class I & III. The only exception was the gonial angle, which was more obtuse in skeletal Class III sample. measurement of gonial angle in pseudo Class III was found to be similar to Class I sample. ***This is main key point in pseudo and Class III***
In additions Rakosi and Sehilli suggested a role for environmental influences such as habits and mouth breathing in the etiology of Class III malocclusion. They hypothesized that excessive mandibular growth could arise as a result of abnormal mandibular posture because constant distraction of the mandibular condyle from the fossa may be a growth stimulus

Skeletal
Maxillary Retrusion(hypoplasia)
MandibularProtrusion (prognathism)
Combination of both maxillary retrusion and mandibular protrusion

DENTO ALVEOLAR
Fewer teeth in the maxillary arch
Narrow upper arch and broad lower arch
Pseudo Class III-posturing forwards for a comfortable bite

SOFT TISSUE
Does not play a major part in aetiology of Class III

OTHER FACTORS
Genetics -Hapsburg Royal Family
Narrow upper arch and broad lower arch

OTHER FACTORS
Craniofacial Anomalies
Cleft Lip and Palate
Binders Syndrome

Incidence

- Global variation in the prevalence of Class III seen
- Greatest in Japanese (up to 13%)
- Lowest figure seen in caucasian Americans (1%)

Diagnosis

History

- ‘Bite the wrong way round’
- ‘Difficult to eat food’
- Teased at school
- Bite getting worse as I get older
- Family history of ‘strong lower jaw’ or facial surgery

Clinical Exam

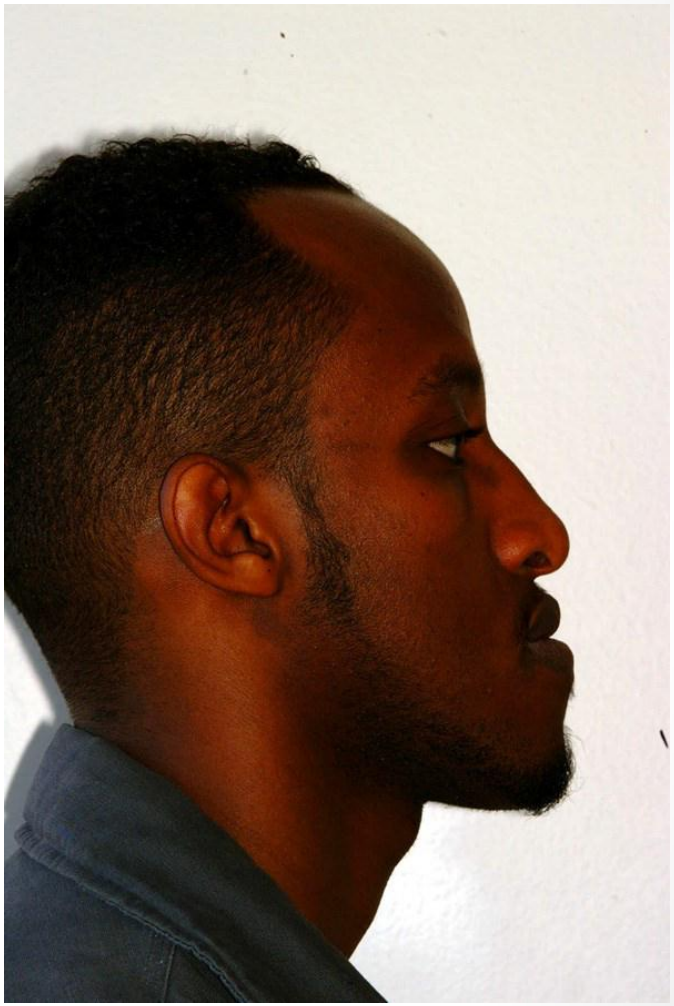
Extra Oral
Hard tissue
Soft tissues

Intra Oral

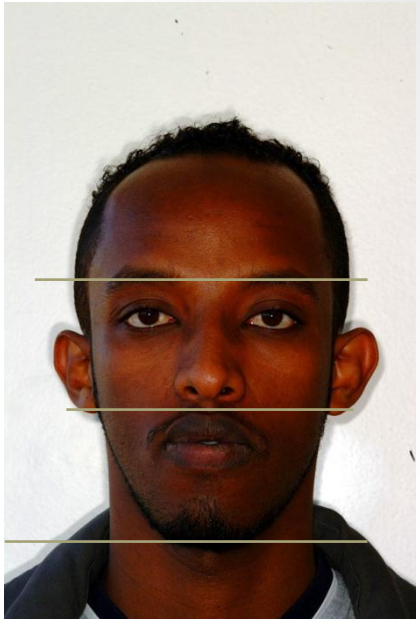
Extra Oral:

Hard Tissues

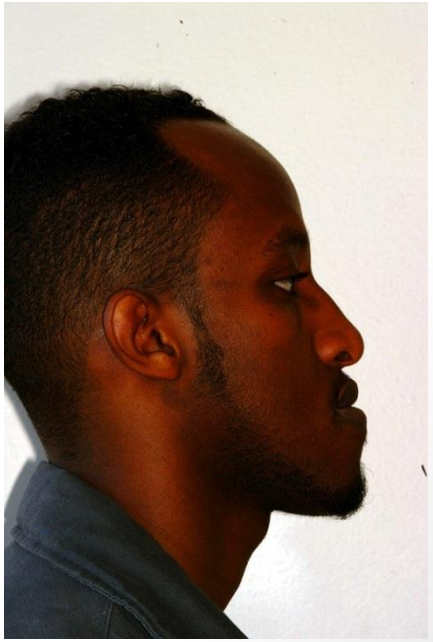
›Antero-posterior
›Vertical
›Transverse



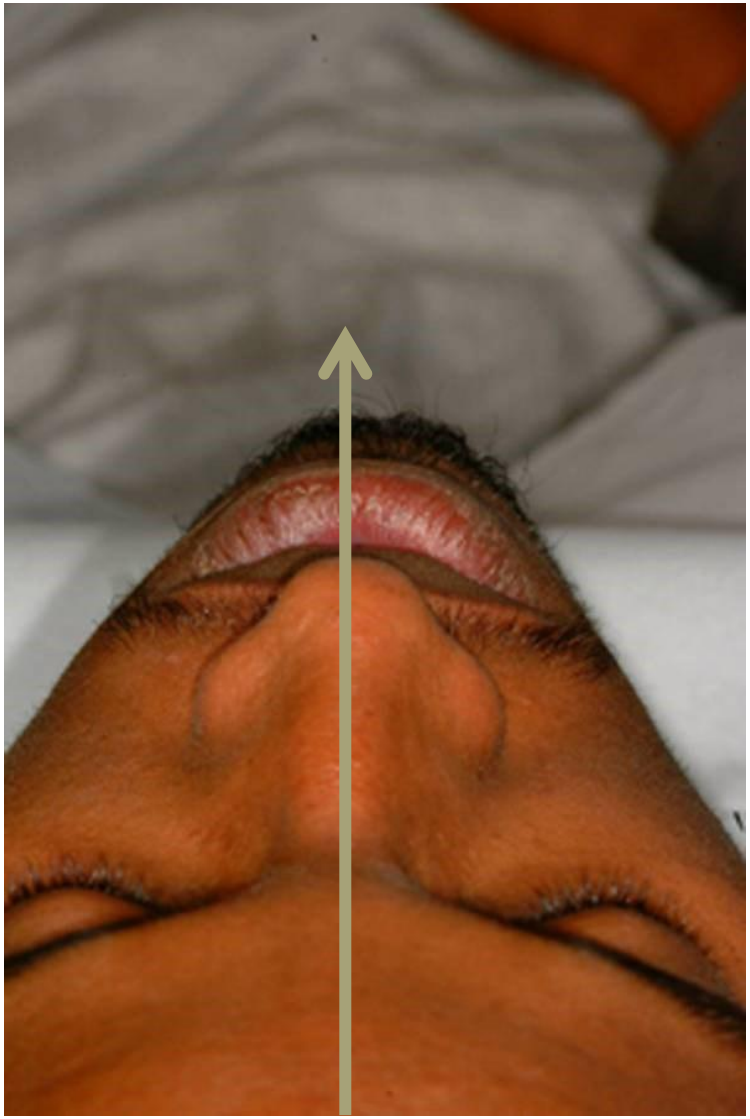
Hard Tissues
Vertical
Assess from front and lateral of patient
Compare mid face to lower face



Hard Tissues
Vertical
Frankfort Mandibular planes



Hard Tissues
Transverse
Assess symmetry



Intra Oral

- In occlusion:
- Incisal relationship
- overjet
- overbite
- centrelines
- Molar relationship
- Crossbites
- Displacements

Radiographs for diagnosis

- OPG
- Lateral Ceph
- standard occlusal

Indications for treatment:

- Check for cross-bite and associated displacement
- Expected pattern of future growth
- The patient opinion on aesthetics
- Patients reported functional problems

Assessment of the case:

Age; Growing / Non Growing

Patients concern -facial or dental

Difficulty of treatment-crowding etc

Amount of dento-alveolar compensation
Upper teeth proclined
Lower teeth retroclined

stability of OB/OJ correction

Treatment options:

do nothing/ wait!
Interceptive
  URA
Functional
  Face mask/ reverse head gear
Camouflage
  Fixed
Comprehensive
 Orthognathic

Treatment timing:

Age (Dental/ Chronological)

›EARLY-Early Mixed Dentition (Growing) Pre age 10

›INTERMEDIATE-Adult dentition still Growing (10-16)

›LATE -Non growing patients (16 onwards)

Early:

Interceptive treatment;

Interceptive -if we don't do the treatment there will be undesirable changes to malocclusion

-Malocclusion has components that can be improved with treatment at this stage - not v severe
-anterior crossbite
-posterior crossbite with displacement
-risk of trauma/dehiscence
Problems -stability, compliance, GROWTH

PROBLEMS:

›Soreness of soft tissue frenum

›Damage to labial face UL1

›Procline LL1 out of bone and cause DEHISCENCE

Other Clinical Concerns:

Displacement;

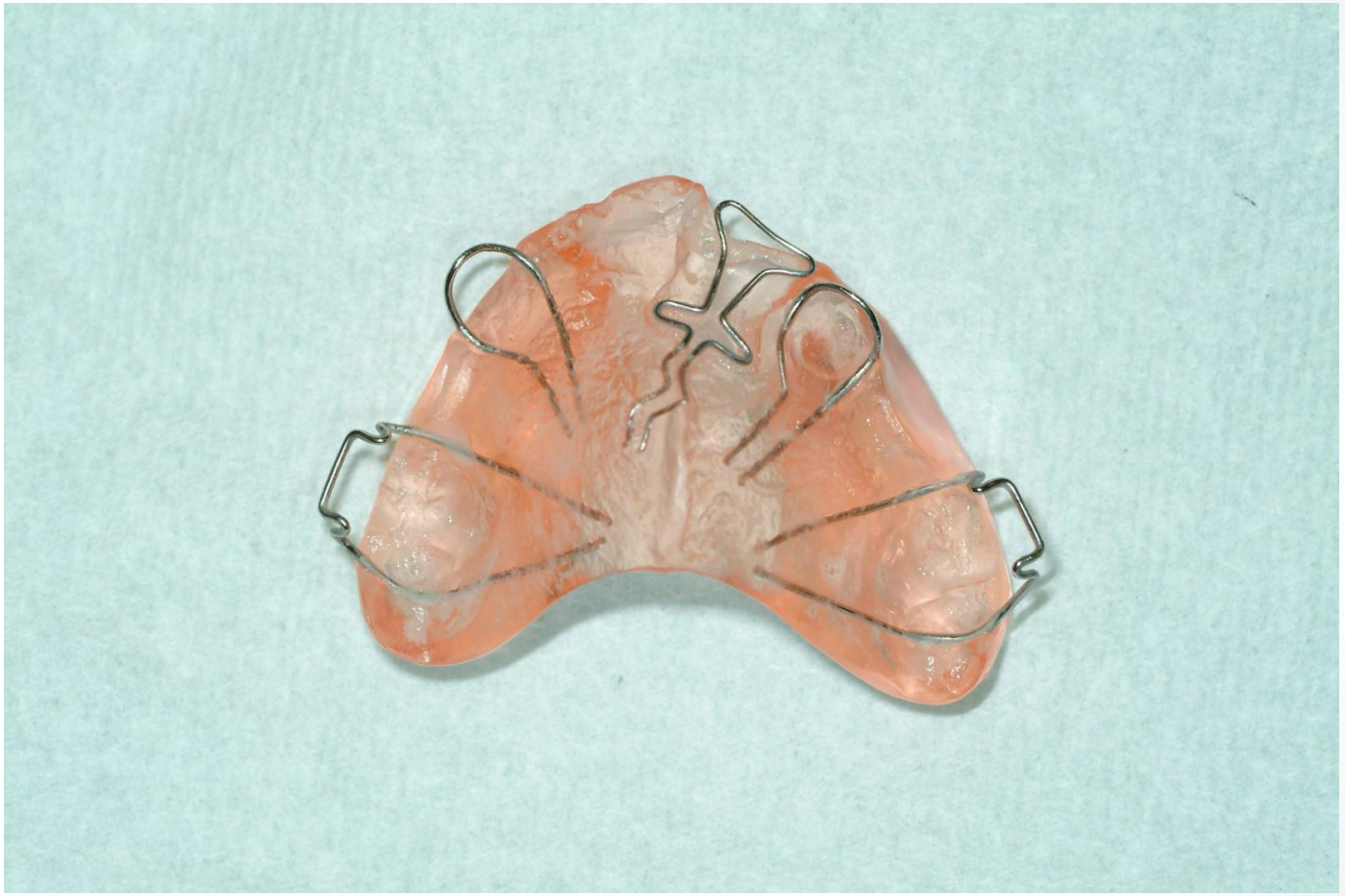
TMJ problems

Mandibular asymmetry

PROGNOSIS

›GOOD -look at overbite

›Overbite will act as retention



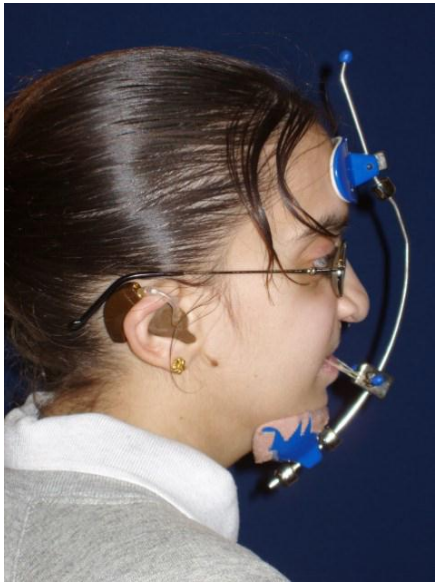
Intermediate treatment:

- GROWTH MODIFICATION
- CAMOUFLAGE

›Case selection very important

Case Assessment:

- Consider the age of the patient
- Degree of Skeletal discrepancy -mild / moderate
- Can the patient achieve edge to edge
- Acceptable facial profile
- Degree of overbite
- Inclination of incisors



- Requires a very cooperative and understanding patient
- Treatment is not guaranteed
- Growth modification needs to be continued throughout growth of maxilla
  -ie a long time treating and possible poor results

Cases are usually mild -moderate

- If severe, treatment at this stage is not beneficial to the patient

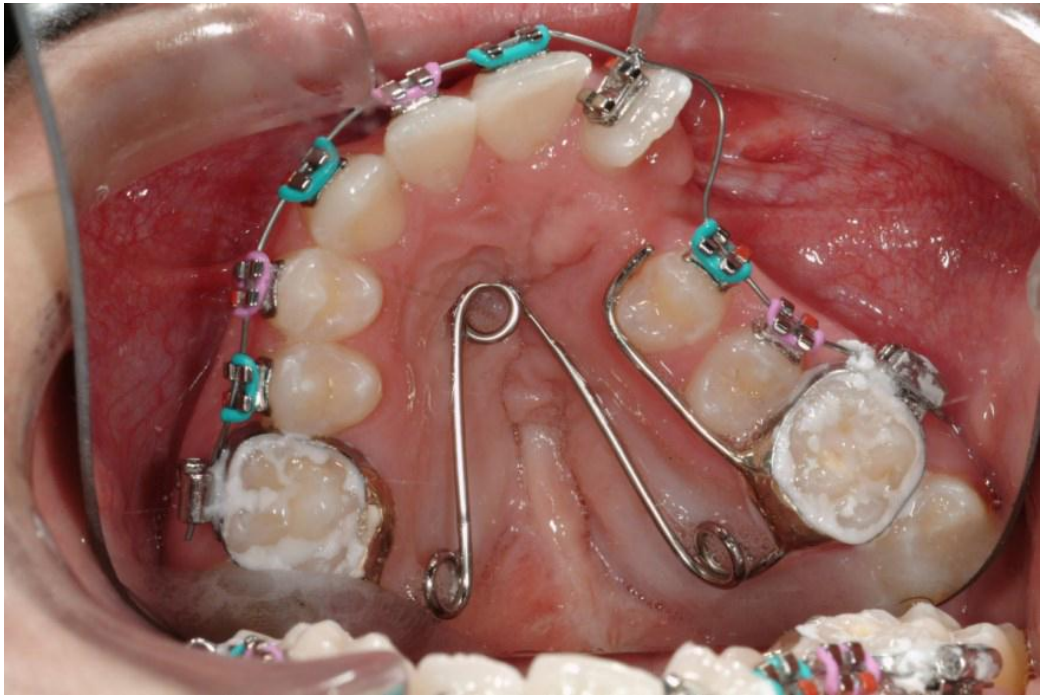
Dental camouflage

- Suitable in a patient with
  - ›Mild -moderate skeletal III pattern
  - ›Patient happy with facial profile
  - ›There is potential for proclining upper teeth and retroclining lower teeth
  - ›There is a good overbite

- Upper and lower fixed appliances
- Either
  non extraction-procline uppers and retrocline lowers
- OR
  Fixed appliances and extractions
  - › pattern may be upper 5/5and lower 4/4

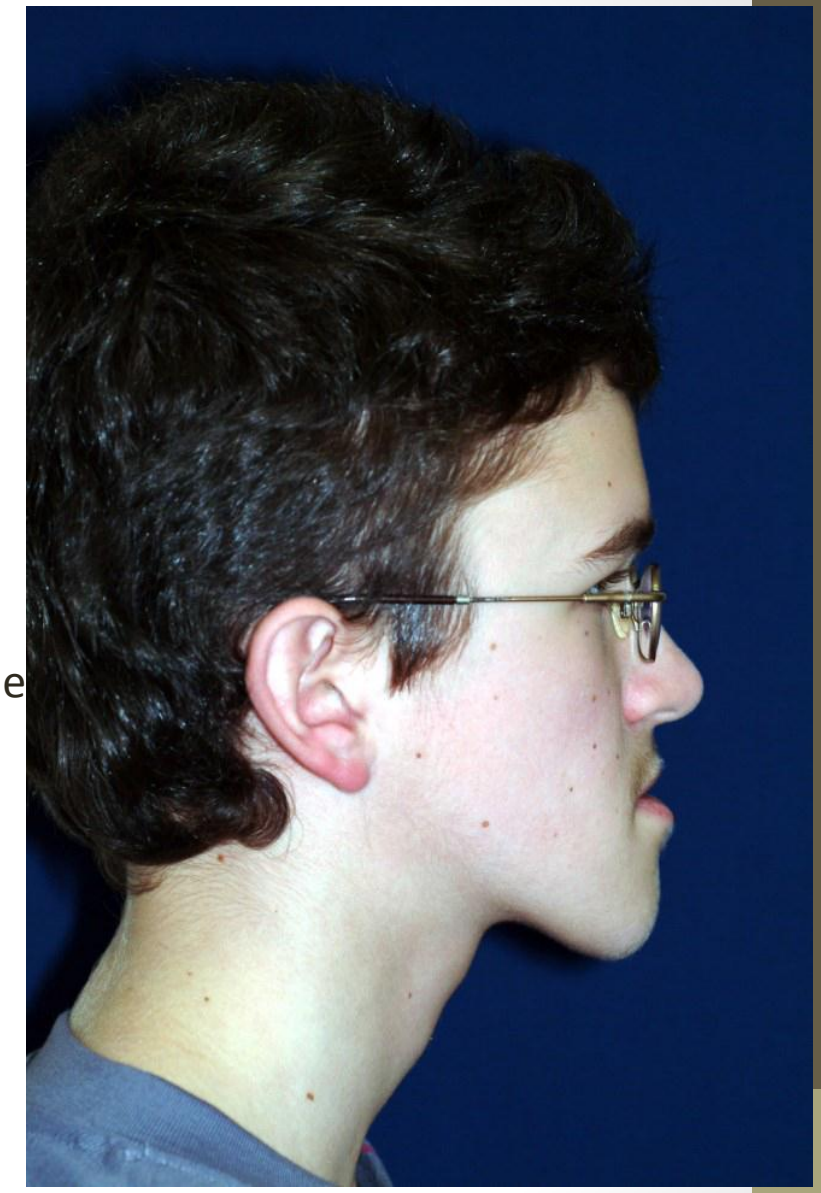
Dental camouflage

- Upper arch expansion may be required to correct cross bites



So---What can go wrong??

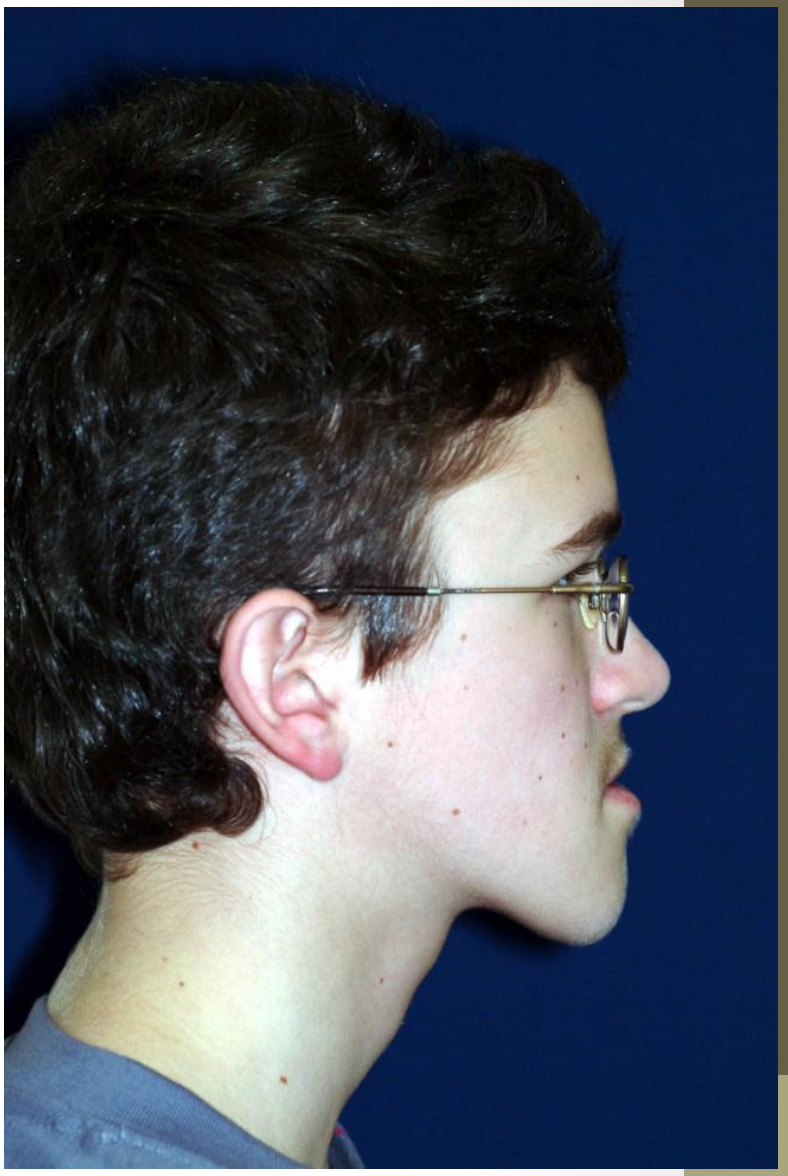
- Unfavourable growth
- Late presentation of a non growing patie
- Patients facial profile a concern



Late treatment

- Growth modification no longer an option
- Patient must have stopped growing
- If facial profile not a concern -CAMOUFLAGE if possible

- If facial profile is a concern
  - ORTHOGNATHIC SURGERY
- Fixed appliances and surgery



Can you start camouflage and then go for surgery??

No!!

The tooth movement to prepare for surgery is OPPOSITE to camouflage treatment

DifferentialPremolar (4s/5s)

- Upper 4s and lower 5s -
allow correction of Class II molars

- Upper 5s and lower 4s -
allow correction of Class III
molars

- Asymmetrical extraction of 4s
and 5s -
allow to correct centrelines

First Molars (6s)

- Often done due to poor prognosis of these teeth in the long term due to gross caries, heavily restored.
- Prolongs the orthodontic treatment (can double the treatment time)
- Prognosis !?patient compliance with long fixed appliance treatment is poor

LOWER ARCH

- Achieving a good occlusion is more dependent upon the timing of the FPM extraction. Lower FPM should only be extracted when bifurcations of the lower permanent second molar starts to calcify, usually at the age of 8½ – 9½ year

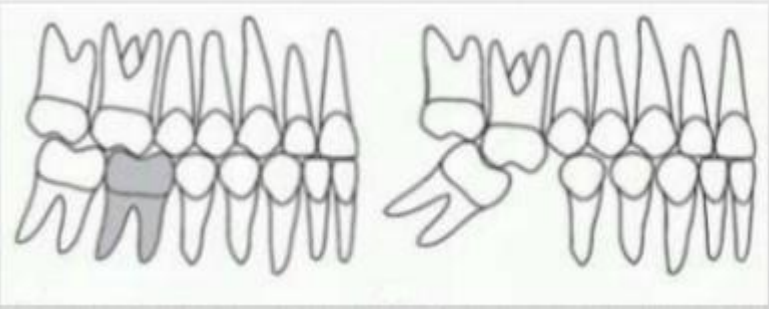
The loss of only a lower first permanent molar after the eruption of the lower second permanent molar (> 8 years) may result in :

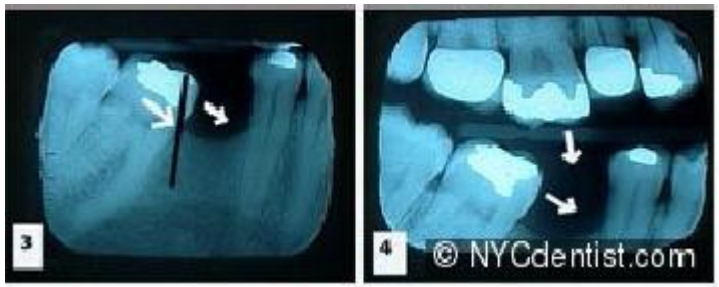
(A) Severe mesial tipping of the lower second permanent molar

(B) Supra-eruption / over eruption of the upper first molar.

permanent molar

(C) Migration or distal tipping of the lower second premolar.





“Compensating Extractions”

- Used with 6s
- When you extract a lower 6 you will extract the upper 6 to stop it over erupting and compromising the occlusion
- When you extract (upper 6) you do not necessarily extract a lower 6 (unless it is poor prognosis) as the lower 6 will not over erupt
- You do not need to balance 6s extractions

Upper Incisors (1s and 2s)

- Rarely chosen due to poor aesthetics
- Poor prognosis due to severe trauma or perio support
- Root resorptionof lateral or central incisors due to ectopic canines
- Developmental malformations: dilaceration, dens in dente,fusion/gemination, macrodont

Lower Incisors (1s or 2s)

- Easy to relieve crowding in cases where the buccal segments are Class I but there is lower incisor crowding
- Useful in adult patients as it is a small space to close who are Class III and want to retract LLS
- Main disadvantage is that crowding re-appears around the remaining incisors and it increases the overbite
- Must have a bonded retainer afterwards

Canines (3s)

- Important teeth as the cornerstone of the arch and needed in canine guidance
- Severely ectopic tooth unsuitable for exposure and bonding or autotransplantation
- Good lateral incisor to first premolar contact in achieved with fixed appliances
- First premolar can be masked as a canine through its rotation with the appliance

Second Molars (7s)

- Rarely the tooth of choice due to its position so far posteriorly
- Aid distal movement of the upper buccal segments
- Relief of very mild lower premolar crowding
- Provides additional space for third molars to avoid their impaction -no guarantee they will erupt!

3rd molar

Guidance

1.1 The practice of prophylactic removal of pathology-free impacted third molars should be discontinued in the NHS.

1.2 The standard routine programme of dental care by dental practitioners and/or paraprofessional staff, need be no different, in general, for pathology free impacted third molars (those requiring no additional investigations or procedures).

1.3 Surgical removal of impacted third molars should be limited to patients with evidence of pathology. Such pathology includes unrestorable caries, non-treatable pulpal and/or periapical pathology, cellulitis, abscess and osteomyelitis, internal/external resorption of the tooth or adjacent teeth, fracture of tooth, disease of follicle including cyst/tumour, tooth/teeth impeding surgery or reconstructive jaw surgery, and when a tooth is involved in or within the field of tumour resection.

Specific attention is drawn to plaque formation and pericoronitis. Plaque formation is a risk factor but is not in itself an indication for surgery. The degree to which the severity or recurrence rate of pericoronitis should influence the decision for surgical removal of a third molar remains unclear. The evidence suggests that a first episode of pericoronitis, unless particularly severe, should not be considered an indication for surgery. Second or subsequent episodes should be considered the appropriate indication for surgery.

NonExtraction Cases

- Very mild cases of crowding
- Will involve arch expansion or arch lengthening to accommodate all the teeth
- Shorter treatment times (if fixed appliance treatment only)
- Often used in Class II/2 cases or in combination with functional appliances
- No guarantee it will be orthodontically stable!

Extraction in orthodontics

Why do we extract teeth in Orthodontics?

“To create space to align the teeth”

“To orthodontically correct a malocclusion”

“Aid dental development through removal of primary or permanent teeth”

To Extract or Not Extract?

- Degree and site of crowding
- Type of malocclusion
- Presence and position of teeth
- Dental health of teeth

Extraction of Primary Teeth

Primary Incisors (As and Bs)

- Extracted if retained and affecting the eruption pathway of the upper 1s or 2s
- Traumatised teeth that are poor prognosis and have not already been avulsed
- Grossly carious teeth

Primary Canines (Cs)

- To aid the eruption of permanent canines (provide room for buccal canines and improve position of ectopic canines)
- Interceptive treatment; (unilateral loss of upper C) causing a shift of the centreline.
- Grossly carious/traumatised teeth

Primary Molars (Ds or Es)

- To allow eruption of the 4s or 5s
- Aid improvement of ectopic position of the developing premolars
- Utilise leeway space from primary molars to relieve crowding (will gain a few millimeters)
- Grossly carious teeth

“Balancing Extractions”

- Used with Cs and Ds
- To stop the centreline drifting towards the side of the mouth the tooth was extracted
- Not necessary with As, Bs and Es as loss of these teeth do not affect the centreline

Extraction of Permanent Teeth

First Premolars (4s)

- Provide ample space to relieve crowding (8-9mm)
- When crowding is moderate to severe and can be used to aid relief anterior or posterior crowding

-Is 100% of the space will be available to align the teeth?? (mesial movement of posterior teeth) if anchorage not reinforced.

- Possibility of impacted canines, where crowding has caused a shortage of space (upper pren[illegible]he canine)

Indications:

1. Convex profile with severe crowding.
2. Class II div I with deep anterior bite.
3. Class I with severe crowding.
4. Class I with bimaxillary protrusion.

SecondPremolars (5s)

- Mild to moderate space required (3-8mm)

- Palatally ectopic 5s -early loss of upper Es
- Lingually ectopic 5s –early loss of lower Es

- Fixed appliances is needed to get a good contact between the first premolar and the first molar

- Around 25-50% of the extraction space will be available to align the teeth (due to mesial movement of posterior teeth) if anchorage not reinforced

Orthodontic indices

Definition of an index

- 'A structured scale or ranking used to allocate a feature or set of features to a particular grade or class'

Properties of an index

- Valid
- Reliable
- Ease of use
- Acceptable to profession
- Cheap

1. Diagnostic indices

- Angle Classification System (1899)8
- Incisal categories of Ballard & Wayman (1964)9

2. Epidemiologic indices

- Index of Tooth Position (Massler & Frankel, 1951)11
- Malalignment Index (Van Kirk & Pennel, 1959)12
- Occlusal Feature Index (Poulton & Aaronson, 1961)13
- Summers' Occlusal Index (1971)14
- • Little's Irregularity Index (1975)16

3. Orthodontic treatment need indices

- Dental Aesthetic Index (DAI) (Cons *et al*, 1986)20
- Index of Orthodontic treatment Need (IOTN) (Brook & Shaw, 1989)21
- Index of Complexity, Outcome & Need (ICON) (Daniel & Richmond, 2000)22

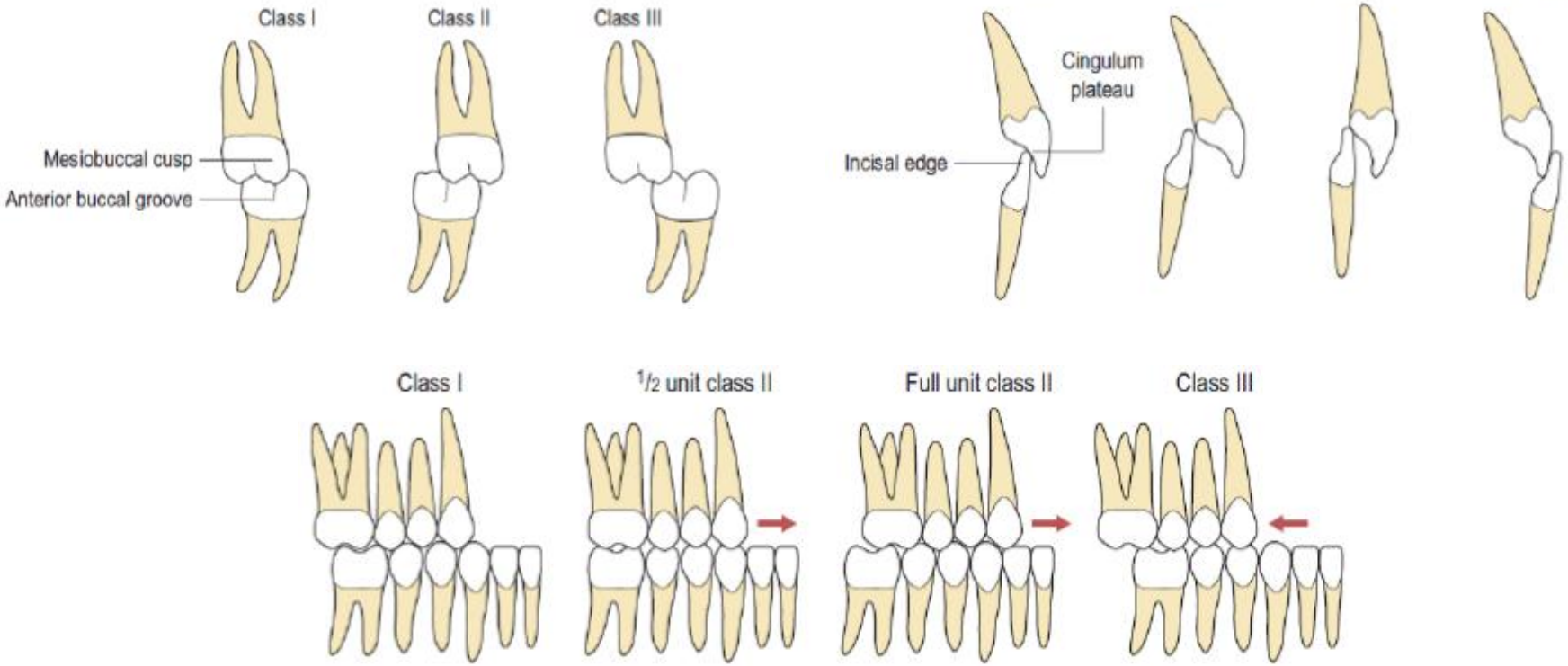
4. Orthodontic Treatment Outcome indices

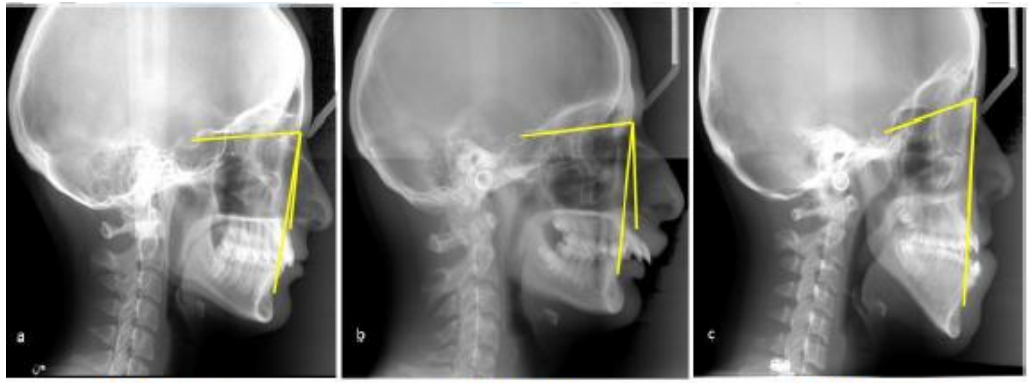
- Peer Assessment Rating Index (PAR) (Richmond *et al*, 1992)23
- Index of Complexity, Outcome & Need (ICON) (2000)22

5. Orthodontic Treatment Complexity Indices

- Index of Orthodontic Treatment Complexity (IOTC) (Liewellyn *et al*, 2007)24
- Index of Complexity, Outcome & Need (ICON) (2000)22

Diagnostic index (the 4 classifications)





Index of Orthodontic Treatment Need (IOTN)

IOTN Components

- DENTAL HEALTH COMPONENT (DHC)
- AESTHETIC COMPONENT (AC)

Dental Health Component (DHC)

- Records the various traits of malocclusion which would increase the morbidity of the dentition & surrounding structures.
- Score the worst feature of Malocclusion (not accumulative)
- Hierarchial scale
- Described using a number and a letter e.g. 5h

- GRADES 1,2 NO / LITTLE NEED
- GRADE 3 BORDERLINE
- GRADES 4,5 NEED TREATMENT

Grade 1	No need for treatment
Grade 2	Little need for treatment
Grade 3	Moderate need for treatment
Grade 4	Great need for treatment
Grade 5	Very great need for treatment

MOCDO: Systematic scoring

- **M**: missing
- **O**: overjet
- **C**: crossbite
- **D**: displacement of contact---point
- **O**: overbite

a	Overjet	h	Hypodontia
b	Reverse overjet with no masticatory or speech problems	l	Posterior lingual crossbite
c	Crossbite	m	Reverse overjet with masticatory or speech problems
d	Displacement of contact points	p	Defects of cleft lip and palate
e	Open bite	s	Submerged deciduous teeth
f	Deep bite	t	Partially erupted teeth, tipped and impacted against adjacent teeth
g	Good occlusion	x	Presence of supernumerary teeth

5 i impeded eruption of teeth (excepting third molars)

5 h extensive hypodontia with restorative implications (> one tooth in any quadrant) needing restorative orthodontic interface.

5 a increased overjet **>9mm.**

5 m reverse overjet **> 3.5mm** with reported masticatory and speech difficulties.

5 p defects of cleft lip and palate / other craniofacial abnormality.

5 s submerged primary teeth.

4 h less extensive hypodontia requiring restorative input or orthodontic space closure to remove the need for prostheses.

4 a increased overjet **> 6mm ≤ 9mm.**

4 b reverse overjet **> 3.5mm**, with no reported masticatory or speech problems.

4 c anterior or posterior crossbites with **> 2mm** displacement

4 m reverse overjet **> 1mm < 3.5mm** with recorded masticatory and speech difficulties.

4 l posterior lingual crossbites (scissors bite), with no occlusal contact in one or both buccal segments.

4 d contact point displacements **> 4mm.**

4 e extreme lateral /anterior open bite **> 4mm.**

4 f increased and complete overbite with palatal trauma.

4 t partially erupted teeth impacted against neighbouring tooth.

4 x supernumerary teeth.

3 a increased overjet **>3.5mm < 6mm** with *incompetent lips*.

3 b reverse overjet **>1mm < 3.5mm.**

3 c anterior or posterior crossbites with **>1mm ≤ 2mm** discrepancy between centric relation and centric occlusion.

3 d contact point displacement **>2mm ≤4mm.**

3 e lateral/anterior open bite **>2mm ≤4mm.**

3 f deep overbite complete on gingival or palatal tissue without trauma

2 a increased overjet **> 3.5mm < 6mm** but with *competent* lips.

2 b reverse overjet **> 0mm < 1mm.**

2 c anterior or posterior crossbite with **≤ 1mm** discrepancy between centric relation and centric occlusion.

2 d contact point displacement **>1mm ≤2mm.**

2 e lateral/anterior open bite **>1mm ≤2mm.**

2 f increased overbite **≥ 3.5mm** without gingival contact.

2 g pre normal or post normal occlusions with no other anomalies (≤ ½ unit discrepancy)

1 extremely minor malocclusions including **<1mm** contact point discrepancies.

Need treatment
Borderline need
Little need
None

Missing teeth • Congenital/developmental absence (h)
• Ectopic or impeded (i)

Missing teeth (hypodontia)

- Mild hypodontia with maximum one tooth missing per quadrant 4h

- Severe hypodontia with >1 tooth per quadrant 5h

Is orthodontic treatment needed to open/close space?

Ectopic/impacted tooth (i)

- If a tooth is out of the line of the arch and unerupted it would be considered (ectopic)

Overjet (a)

Increased overjet

- The overjet is recorded to the labial aspect of the incisal edge of the most prominent incisor.

Positive overjet	
2.a competent lips	3.5 mm — 6 mm
3.a incompetent lips	3.5 mm — 6 mm
4.a	6 mm — 9 mm
5.a	Greater than 9 mm

Reversed overjet

- Recorded when all four incisors are in lingual occlusion.
- It is important to investigate masticatory and speech (M&S) difficulties.

Crossbite (c)

- Anterior crossbite

- Posterior crossbite

Crossbite with Mand. displacement

2.c	I<= 1 mm
3.c	1- 2 mm
4.c	> 2 mm

Displacement of Contact point (d)

2.d	1 mm — 2 mm
3.d	2.1 mm — 4 mm
4.d	Greater than 4 mm

Overbite (f)

- The largest vertical discrepancy is recorded.
- It is also important to note if there is any gingival or palatal trauma as a result of the deep overbite

Overbite	
Grade and qualifier	
2.f	Increased greater than or equal to 3.5 mm
3.f	Deep overbite complete on labial or palatal tissues but no trauma
4.f	Increased and complete overbite with labial or palatal trauma

Openbite (e)

Open bite	
Grade and qualifier	
2.e	Anterior or posterior open bite 1 mm —2 mm
3.e	Anterior or posterior open bite 2.1 mm — 4 mm
4.e	Extreme lateral open bites greater than 4 mm

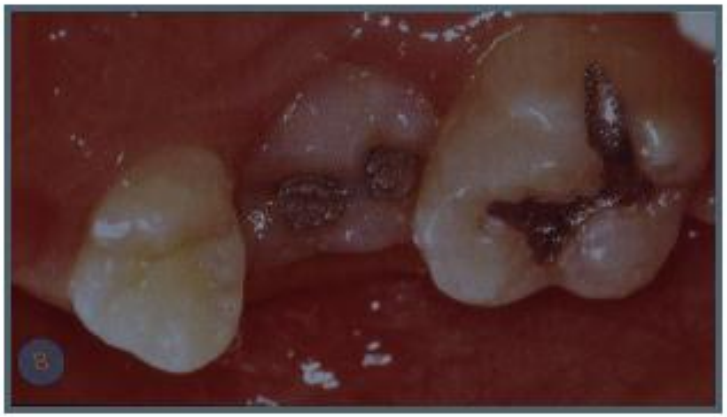
CLP (5p)

- Defects of cleft lip and palate and other craniofacial anomalies

Supernumerary tooth (4x)

- If a supernumerary tooth requires extraction followed by orthodontic alignment and/or space closure

Submerged tooth (5s)



Aesthetic component

- Photographs labelled 1-10 in increasing order of unpleasing aesthetics
- Rating by clinician

1,2 No need for Treatment

3,4 Slight need

5,6,7 Borderline

8,9,10 Definite

- **Little's Irregularity Index (treatment complexity)**

- **Peer Assessment Rating Index (PAR); treatment outcome index.**

Anterior crowdingX1
OverjetX1
OverbiteX6
Buccal occlusionX2
CentrelinesX4

PAR reduction <30%, >30%, >70%, 22points

Diagnostic aids

Orthopantomgrahy

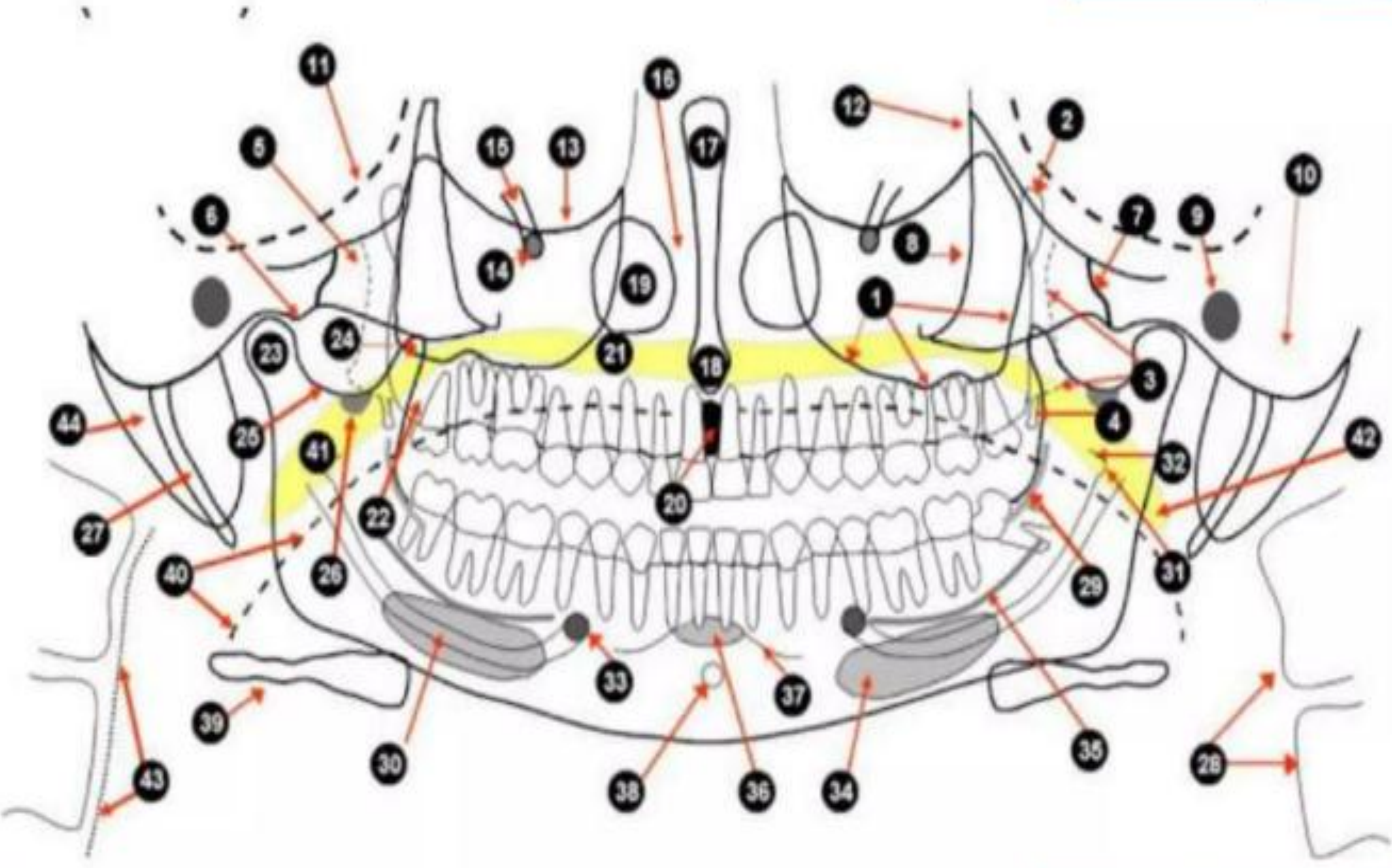
1.Calculation of total teeth substance .
2. Number, size and shape of the teeth.
3.Development of teeth.
4. Evaluation of Third molars
5.Impacted teeth.
6.Medicolegal purposes

.

- **To detect diseases, lesions and conditions of the jaw (eg: Carcinoma in relation to the jaws), or Diagnosis of developmental anomalies such as Cherubism, Cleidocranial dysplasia.**
- **To examine extent of large lesions.**
- **To evaluate tempero-mandibular joint dysfunctions and ankylosis.**
- **Periodontal bone loss and periapical involvement.**
- **Assessment for the placement of dental implants.**
- **Intolerant to intraoral procedures (Use in patients unable to open their mouth).**
- **In patient education and case presentation.**

Limitations of orthopantomogram:

- **Limited image clarity.**
- **Magnification.**
- **Lack of 3-dimensional information.**
- **False negative diagnosis of maxillary sinus septa due to low sensitivity and specificity.**
- **Risk of overestimating bone quantity after sinus grafting procedures**.



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1. maxillary sinus
2. pterygomaxillary fissure
3. pterygoid plates
4. hamulus
5. zygomatic arch
6. articular eminence
7. zygomaticotemporal suture
8. zygomatic process
9. external auditory meatus
10. mastoid process
11. middle cranial fossa
12. lateral border of the orbit
13. infraorbital ridge
14. infraorbital foramen
15. infraorbital canal
16. nasal fossa
17. nasal septum
18. anterior nasal spine
19. inferior concha
20. incisive foramen
21. hard palate
22. maxillary tuberosity
23. condyle
25. sigmoid notch
26. medial sigmoid depression
27. styloid process
28. cervical vertebrae
29. external oblique ridge
30. mandibular canal
31. mandibular foramen
32. lingula
33. mental foramen
34. submandibular gland fossa
35. internal oblique ridge
36. mental fossa
37. mental ridges
38. genial tubercles
39. hyoid bone
40. tongue
41. soft palate
42. uvula
43. posterior pharyngeal wall
44. ear lobe
45. glossopharyngeal air space
46. nasopharyngeal air space
47. palatoglossal air space


ZONE 4
ZONE 2
ZONE 4
ZONE 5
ZONE 1
ZONE 5
ZONE 6
ZONE 3
ZONE 6

Advantages of an orthopantomogram:

1. A large area visualized.

2. Radiation is low, less than that for four IOPAs.

3. Patient cooperation is rarely a problem.

4.Inter-operator variation is minimal .

Disadvantages of an orthopantomogram

1. Specialized equipment is required.

2. Distortions, magnifications and overlapping of structures.

3. Definition of structures is not as good as in IOPAs.

4. It is not standardized.

5. lOPAs may still be required.

How to read the X

Orient the radiograph as when looking at the patient, i.e. with the patient's left side positioned on the clinician's right. (view box)

Start examining from the right condylar head and follow the outline along the neck and the posterior border of the ramus. Continue following the outline of the mandibular body to the symphyseal region anteriorly along the lower border of the mandible to the left condyle.

. The third molar development position should definitely be noted as it may play an important role in determining the type of retention planned and/or their enucleation if required.

Examine the cortical outline of the maxilla starting on the right side. Trace the pterygo-maxillary fissure, hard palate with the anterior nasal spine.

Examine the nasal cavities and the nasal septum followed by the maxillary sinuses. It is advisable to compare the right and left sides especially of the nasal cavities and the maxillary sinuses.

Margins of a number of soft tissue structures may be seen on the orthopantomogram. These include the--- tongue, soft palate, nose

Radiopaque shadows, which superimpose on normal anatomic structures are called "ghosts" and are actually artifacts. These can sometimes pose a problem in radiographic interpretation. These are created when the X-ray beam projects through a dense object, e.g. the spinal cord and the opaque shadow of the object projects onto the opposite side of the radiograph.

Finally evaluate the teeth for-presence, stage of development, state of eruption un erupted or impacted teeth, placement, root morphology and position, cavities, fractures, contacts, and/or any pathology .

These findings have to be clinically correlated and/or with TOPA's or bitewing radiographs.The maxillary and mandibular cusp tips should be generally separate (unless there is a change in the cant of occlusion and there should be gentle curve to the occlusal plane.The orthopantomogram may not be sufficient by itself. If any doubt arises, it is recommended that an lOPA of the concerned area is taken.


R
L

INTRAORAL RADIOGRAPHS

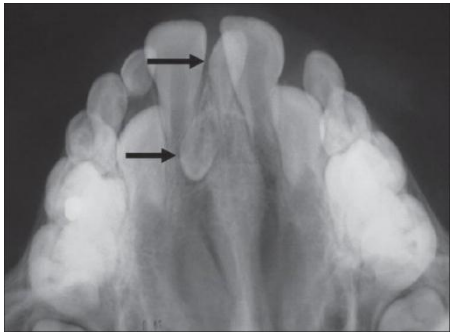
Intraoral periapical radiographs (IOPA).

The advantages of periapical radiographs are:
1- Low radiation dose.
2- Excellent clarity of teeth and their supporting structure.
3- Possibility of obtaining localized view of area of interest.

Disadvantages of the IOPAs: Increased radiation that a person has to undergo to cover the full complement of his/her teeth. Also at times the patient is not cooperative, and may not allow the repeated placement of films in the desired manner in his/her mouth

Bitewing radiographs

Occlusal radiographs



Intraoral occlusal radiographs are of special interest to an orthodontist when dealing with impacted teeth or for the study of the labio-lingual position of the root apices in the anterior segments. They are particularly useful in the maxillary arch, for assessing root form of the incisors, the presence of midline supernumerary teeth and canine position, either alone or in combination with additional views using **-**parallax.

Hand-Wrist and cephalometric Radiographs for skeletal maturity:

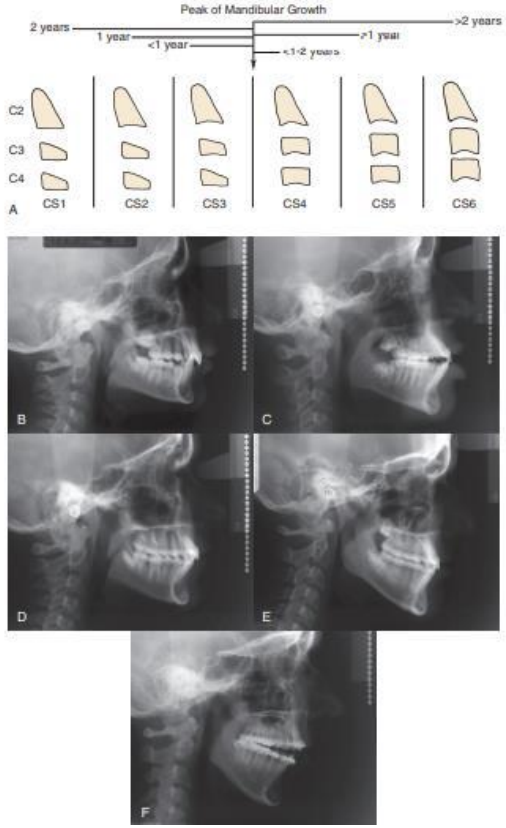
Hand-wrist radiographs have been widely used to assess skeletal maturity.

The ossification of the bones of the hand and the wrist was for many years the standard for skeletal development. A radiograph of the hand and wrist provides a view of some 30 small bones, all of which have a predictable sequence of ossification

Hand-wrist radiographs have been correlated to:
1- Dental development 2- Peak height velocity 3- Cervical vertebrae
4- Cranial base outline 5- Spheno-occipital synchondrosis

The cervical vertebral maturation [CVM] method:

(Assessment of skeletal age based on the cervical vertebrae, as seen in a cephalometric radiograph)



provide a two dimensional image of a three-dimensional structure, with all the associated errors of projection, anatomical superimposition, landmark identification, measurement and interpretation.

Three-dimensional imaging

Cone beam computed tomography:

Three-dimensional imaging technique for three dimensional structure
CT , CBCT

Applications of Cone Beam Computed Tomography:

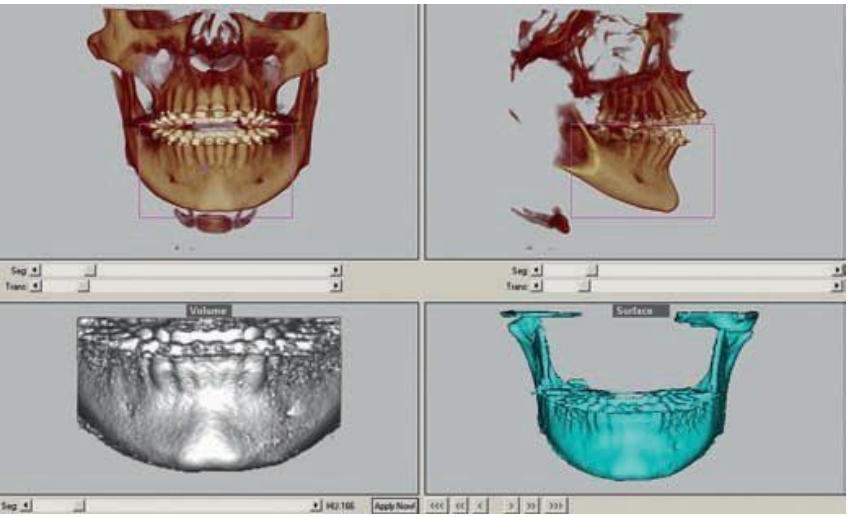
-View structures from all three planes of space without any superimposition and geometric distortions.
-Synthetic cephalometric and panoramic images can be produced.

-disadvantage, Increased radiation exposure

Diagnosis of: Ectopically erupting or impacted teeth (especially maxillary canines) requiring surgical exposure and orthodontic tooth movement to bring them into the mouth.
Severe facial asymmetry, especially asymmetries involving roll and yaw.
Syndromes, congenital deformities, and sequelae of facial trauma

recommendations have been reported focusing on the specific role of CBCT in orthodontic diagnosis, these are:

1- The routine use of CBCT in orthodontic diagnosis is to be discouraged;
2- CBCT may be indicated for the localized assessment of an impacted tooth (including consideration of resorption of an adjacent tooth) when the information cannot be obtained adequately by lower dose conventional radiography.
3- CBCT is not normally indicated for planning the placement of temporary anchorage devices(miniscrews).
4- CBCT is indicated for orthognathic surgical planning.
5- Where the current imaging method of choice for the assessment of cleft palate and temporomandibular joint, is conventional CT, therefore CBCT may be preferred if the radiation dose is lower.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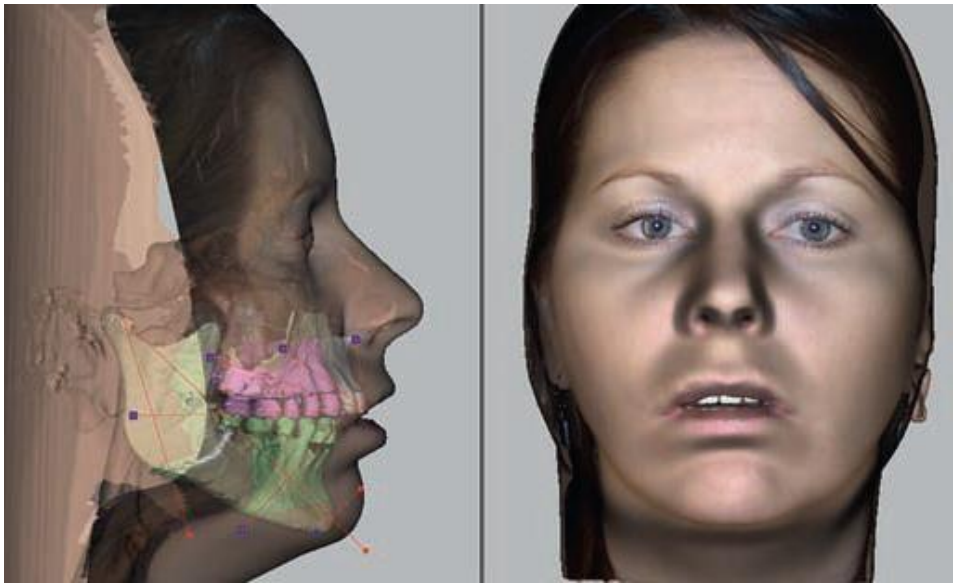


STUDY MODEL

Tray selection

Patient and operator position

Impression mixing

Loading the tray

Intra-oral scanning (Digital study models)

Importance

1.Three dimensional records of the patient's dentition.

2. Visualization of occlusion from the lingual aspect.

4. Monitors changes taking place during tooth movement.

5. Patient motivation.

6. Reference for post-treatment changes.

7. They serve as a reminder for the parent and the patient of the condition present at the start of treatment.

8. In case the patient has to be transferred to another clinician, study models are an important record.

Uses:

1. Assessment of dental anatomy, intercuspation and arch form

2. Important for conducting the Total space analysis

3. Assess and record the curves of occlusion

4. Evaluate occlusion with the aid of articulators

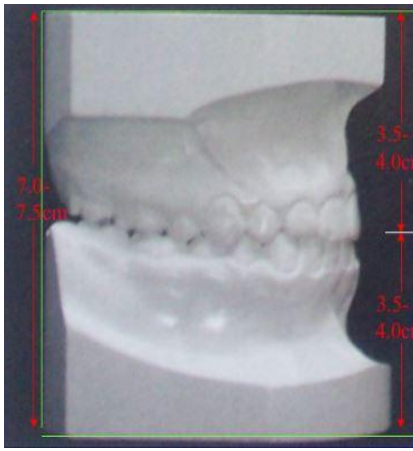
5. Measure progress during treatment

6. Detect abnormality, e.g. localized enlargements, distortion of arch form, etc.

7. Provide record before, immediately after and several years following treatment for the purpose of studying treatment procedures and stability.

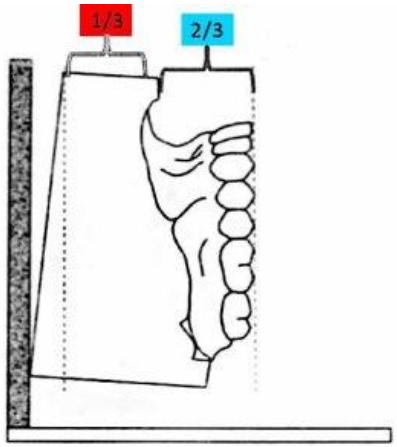
REQUERMENTS OF STUDY MODELS

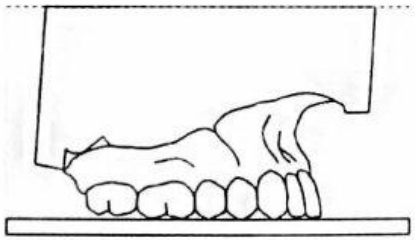
1. Accurately reproduce the teeth and their surrounding soft tissues.
2. Trimmed symmetrically, pleasing to the eye.
3. Dental occlusion shows by setting the models on their backs.
4. Clean, smooth, bubble-free surfaces with sharp angles where the cuts meet and glossy mar finish.

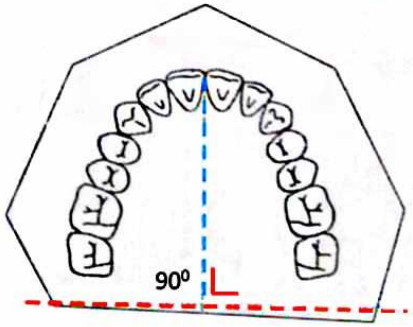


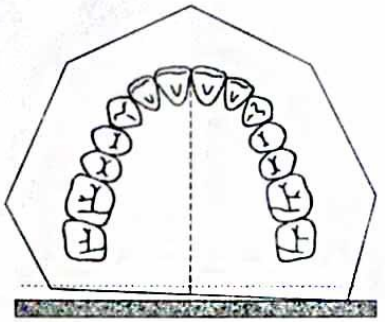
- Anatomic Portion - Consists of the actual impressions of the dental arch & its surrounding structures.
- Artistic Portion - Consists of the plaster base that supports the anatomic portion and helps in analysing the occlusion & orientation of the study models.

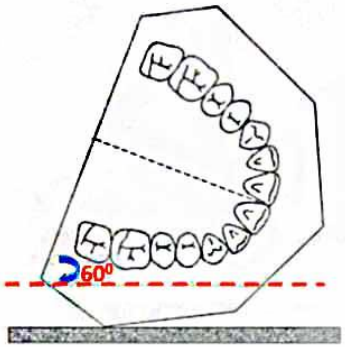
Trimming

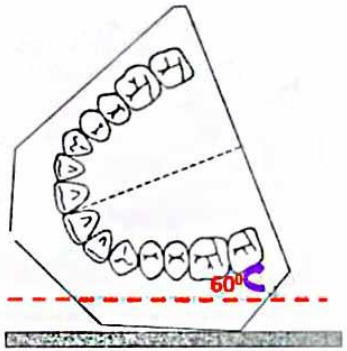


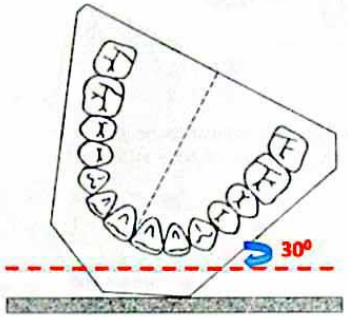


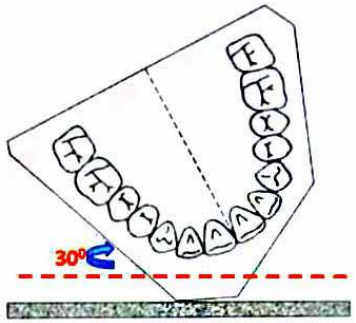


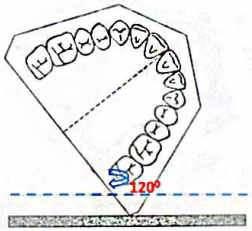


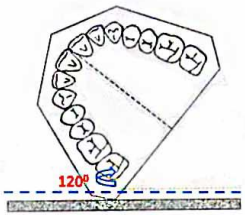


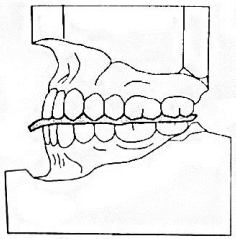


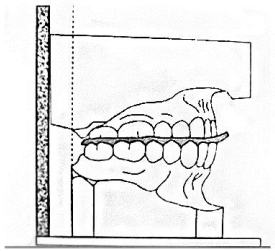


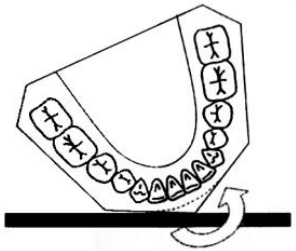


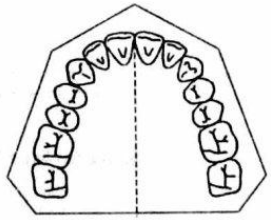


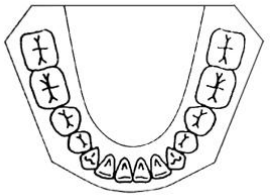










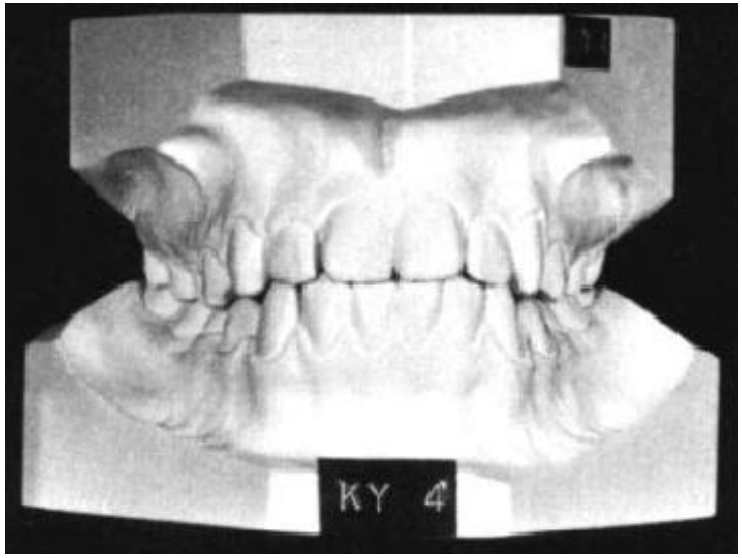


Finishing, handling

- Essential diagnostic aids in orthodontics.
- Allows us to carefully examine several parameters (dentition, jaw relationships) and make objective measurements for detailed evaluation and treatment planning.
- The study model provides a three dimensional view of the maxillary and mandibular dental arches in all three planes of space, i.e., sagittal, vertical and transverse planes.

Advantages of study cast

1. Degree of Malocclusion can be diagnosed in the three dimensions..
a) Transverse plane
b) A-P plane
c) Vertical plane
2. Inter arch irregularities. Inter arch relationship
3.To view lingual occlusion.
4. Transverse discrepancies.
5. Motivation of patient.
6. Prognosis of the case – patient and doctor.
7. Treatment planning – (surgery).
8. Dental health education.
9. Assessment of the palatal vault.
10. Helps in detecting midline discrepancies.



FACIAL PHOTOGRAPHS:

- Extraoral photographs
- Intraoral photographs

EXTRAORAL PHOTOGRAPHS

should be taken before starting treatment and after completion of treatment.

Uses:

1. Evaluation of craniofacial relationships and proportions before and after treatment.
2. Legal point of view. 3. Assessment of soft tissue profile 4. Analysis
5. Monitoring of treatment progress 6. Longitudinal study of treatment and post retention follow-up
7. Detection and recording muscle imbalances and facial asymmetry. 8. Identifying patients

Guidelines for extra-oral photographs (American Board of Orthodontics)

- Standardized facial photographs either blackened white or color prints.
- One lateral view, facing right, serious expression, lips closed lightly to reveal muscle imbalance and disharmony.
- Background free of distractions
- No shadows in the background
- Ears exposed
- Eyes open and looking straight ahead, glasses removed.

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INTRAORAL PHOTOGRAPHS

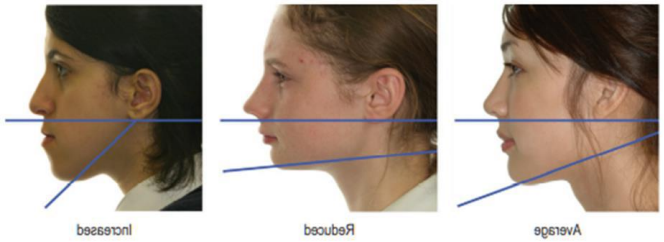
Intraoral photographs are considered non-essential diagnostic records yet they are simple to take, maintain and store, this is because they are neither standardized nor three dimensional. Must be taken before, during and after finishing the treatment

Used for:

1- Motivating the patient.
2- Monitor treatment progress .
3- Recording health or disease of the teeth and soft tissue structures.
4- Study of relationships before, immediately following and several years after treatment.

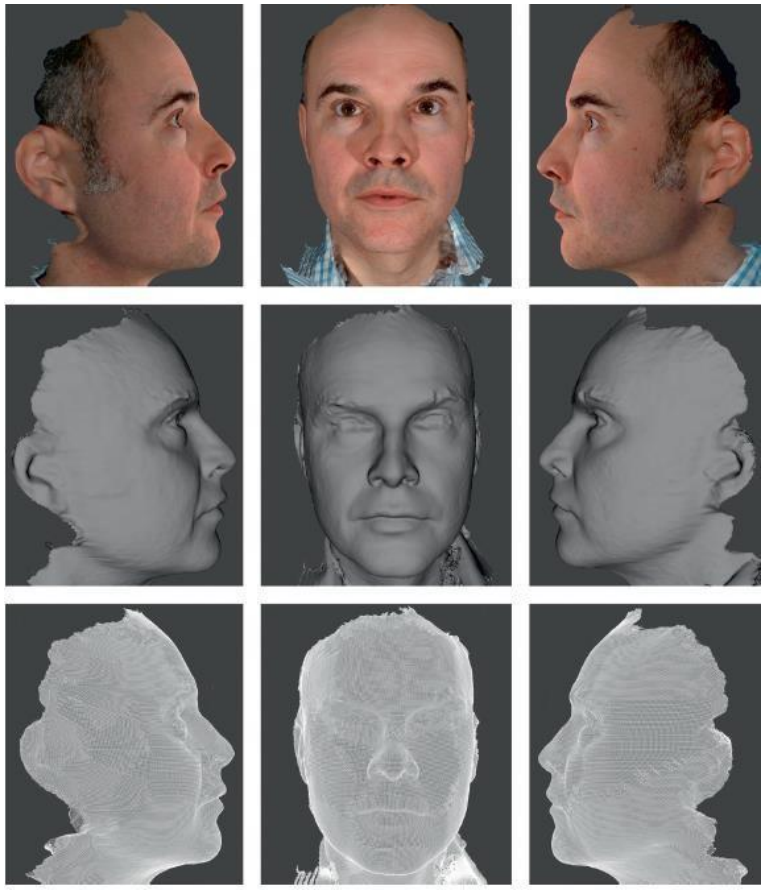
The American board of orthodontist's guidelines for intraoral photographs;

1. Quality 2. Oriented accurately in all three planes of the space 3. One frontal photograph in maximum intercuspation
4. Two lateral views-right and left 5. Optional-two occlusal views-maxillary and mandibular
6. Free of distractions-retractors, labels etc. 7. Quality lightening revealing anatomical contours and free of shadows.
8. Tongue should be retracted posteriorly. 9. Free of saliva and/or bubbles. 10. Clean dentition.


Increased
Reduced
Average

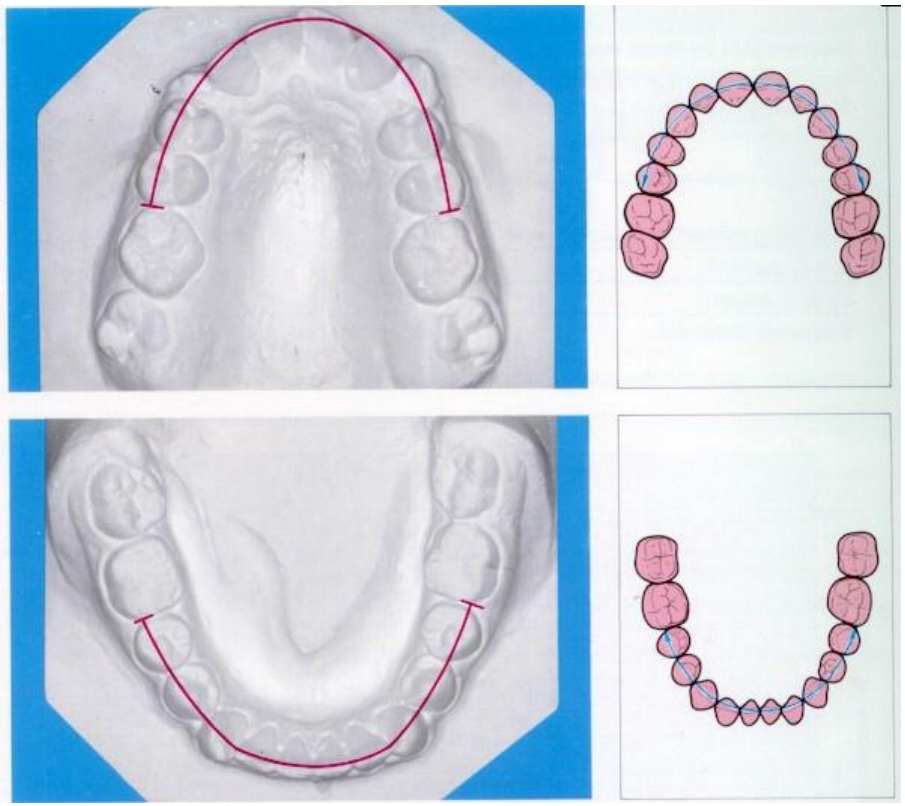
Optical laser scanning and stereo photogrammetry

-Study facial growth
- Soft tissue changes in normal populations
- Investigate the effects of orthodontic and surgical treatment



Space analysis
(MODEL ANALYSIS)

Dr. Natheer



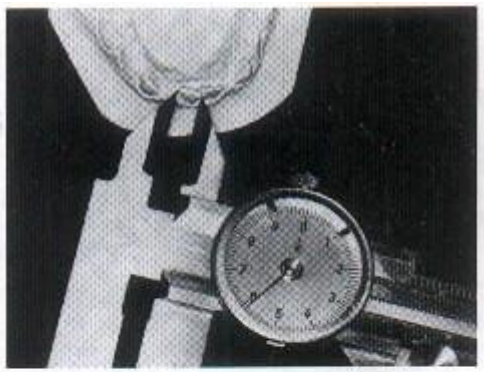
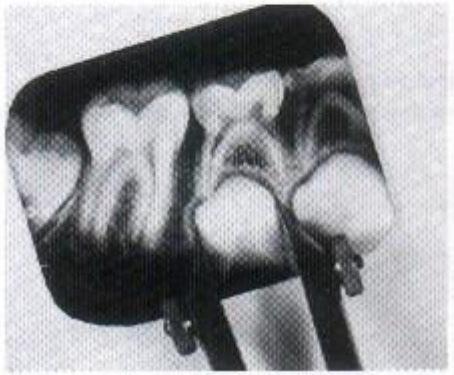
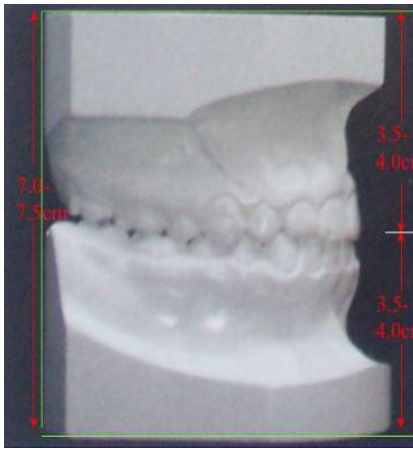


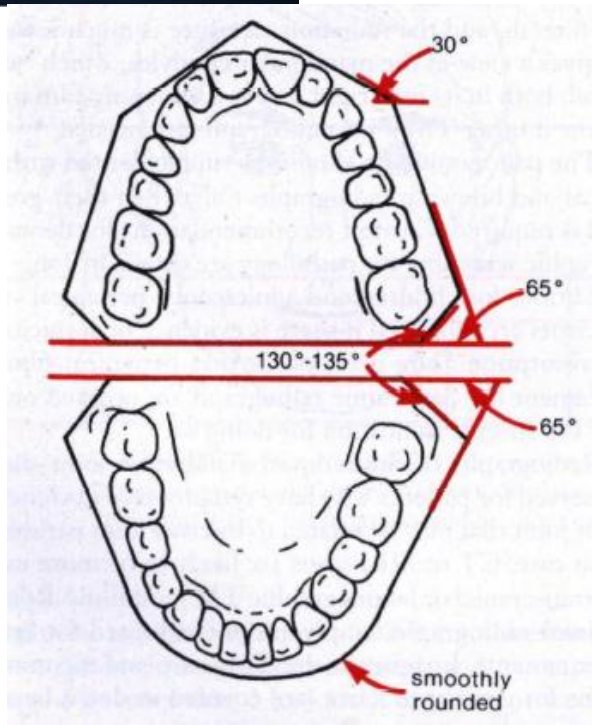
FIGURE 9-75
Measurement of space required on study models with a Boley gauge.



REQUERMENTS OF STUDY MODELS

- Should accurately reproduce all the teeth and soft tissues without any distortion.
- Should be trimmed symmetrical on either side.
- Posterior surface should be trimmed, such that when placed on their back they should reproduce the occlusal plane.
- Should reproduce the alveolar process as much as possible.





- Anatomic Portion - Consists of the actual impressions of the dental arch & its surrounding structures.
- Artistic Portion - Consists of the plaster base that supports the anatomic portion and helps in analysing the occlusion & orientation of the study models.

MODEL ANALYSIS

- Essential diagnostic aids in orthodontics.
- Allows us to carefully examine several parameters (dentition, jaw relationships) and make objective measurements for detailed evaluation and treatment planning.
- The study model provides a three dimensional view of the maxillary and mandibular dental arches in all three planes of space, i.e., sagittal, vertical and transverse planes.

Advantages of study cast analysis

1. Degree of Malocclusion can be diagnosed in the dimensions..
   a) Transverse plane
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   c) Vertical plane
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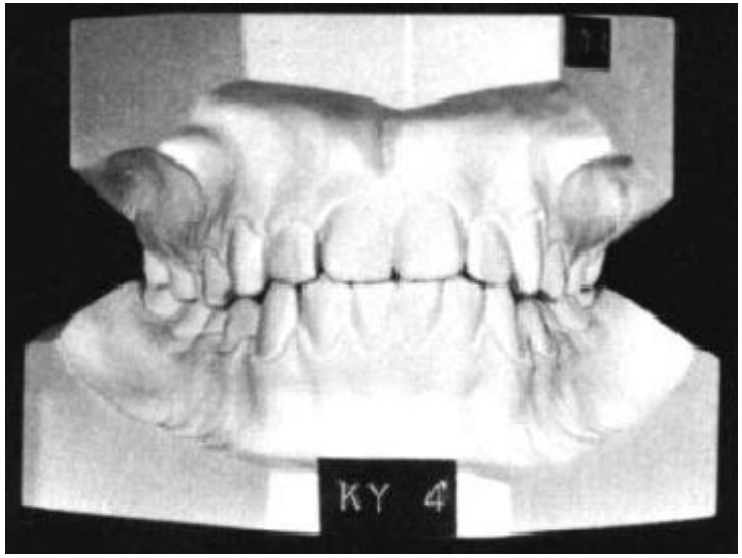
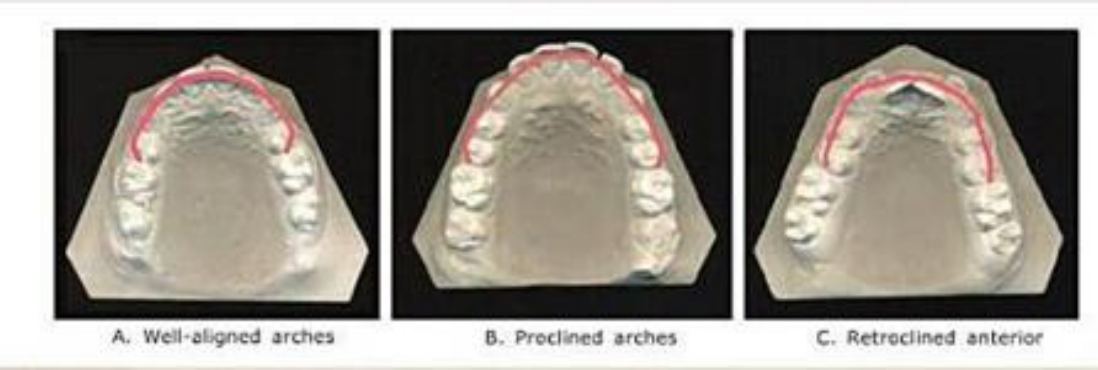


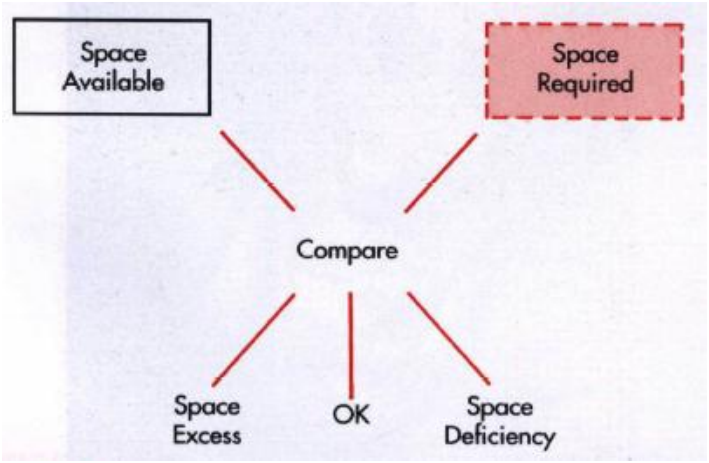
PERMANENT DENTITION - MODEL ANALYSIS	**MIXED DENTITION-MODEL ANALYSIS**
Arch perimeter analysis	Moyer's Mixed dentition analysis
Carey's analysis	Tanaka and johnston analysis
Ashley Howe's analysis	Nance mixed dentition analysis
Pont's analysis	Huckaba's mixed dentition analysis (Radiographic method)
Linder Harth analysis	
Korkhaus analysis	
Bolton's analysis	

ARCH PERIMETER ANALYSIS

- Many malocclusions occur due to discrepancy between arch length & tooth material.
- Two measurements are required for intra-maxillary analysis of space requirement:
  1. Calculation of space required
  2. Calculation of space available.
- Arch perimeter is the geometrical dental arc formed by teeth at their incisal / cuspal edges.



Space analysis requires a comparison between the amount of space available for the alignment of the teeth and the amount of space required to align them properly .



- **DETERMINATION OF SPACE REQUIRED:**
- measure the mesiodistal dimension of all the teeth mesial to the first molar (54321|12345)

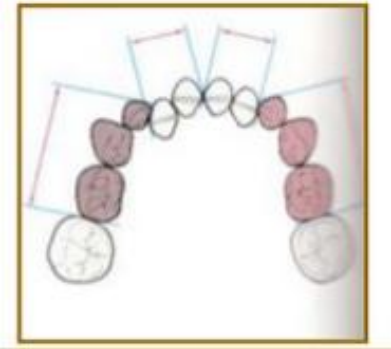
- **DETERMINATION OF SPACE AVAILABLE:**

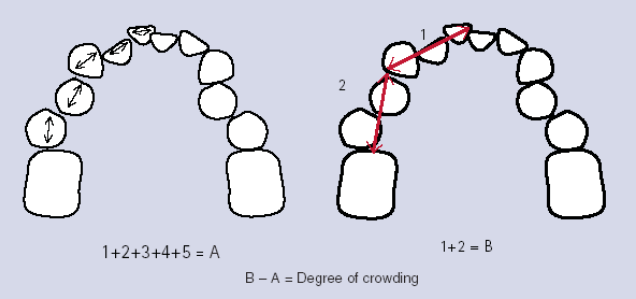
1. measure the arch perimeter using brass wire. From mesiobuccal line angle of maxillary right first molar , pass the wire along the buccal cusp and incisal edges in the anterior region, 'pass the wire on the left quadrant like a mirror image till the mesiobuccal line angle of the left maxillary first molar.

2. Mark the wire and measure the wire, which gives the space available.

DETERMINATION OF THE DISCREPANCY

- If the tooth material is more than the arch length, the space available for alignment is not sufficient results in crowding.
- If the tooth material is less than the space then there can be spacing.





CAREY'S ANALYSIS

The arch length-tooth material discrepancy is the main cause for most malocclusions.

This discrepancy can be calculated with the help of Carey's analysis.

The analysis is carried out in the lower arch.

ARCH LENGTH DISCREPANCY	INFERENCE
0 to 2.5 mm	Proximal stripping can be carried out to reduce the minimal tooth material excess
2.5 to 5 mm	Extraction of second premolar is indicated
Greater than 5mm	Extraction of first premolar is usually required

BOLTON'S ANALYSIS

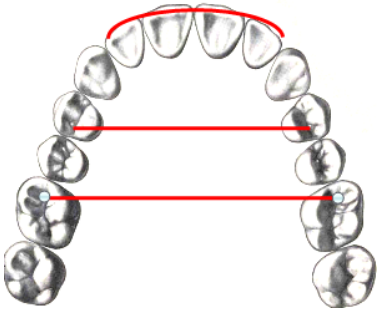
- Wayne Bolton considered the ratio of the tooth material of the maxillary arch to the mandibular arch i.e M-D widths of upper & lower teeth by nature have predetermined proportions to maintain normal occlusal relaionship.
- An alteration in this balance will lead to improper intercuspation, overjet or spacing
- Bolton said that extraction of one/several tooth should be done acc. to the ratio of tooth material b/w upper & lower arch to get ideal overjet & overbite .

- Overall Ratio = $\frac{\text{Sum of mandibular 12 teeth} \ *100}{\text{Sum of maxillary 12 teeth}}$
- For establishing ideal overjet & overbite overall ratio should be 91.3%
- If the overall ratio is less than 91.3%, it indicates maxillary tooth material excess.
- Disadvantages:
  - Does not take into account the sexual dimorphism in the maxillary canine widths.
  - Study done on specific population.

PONT'S ANALYSIS

- Pont in 1909, proposed a method of determining the ideal dental arch width in premolar and first molar area based on the sum total of mesio-distal widths of maxillary incisors. He suggested that the ratio of the combined upper incisor width to transverse arch width was ideally 0.80 in the premolar area and 0.64 in the molar area.
- He also suggested that the maxillary dental arch should be expanded 1-2 millimeters more during treatment than that found in normal occlusion to allow for relapse.
  - Determining whether the dental arch is narrow or is normal in the premolar and molar region for a given sum of widths of incisors.
  - Determining the need for lateral arch expansion.
  - Determining how much expansion is possible at the premolar and molar regions.

determination of sum of incisors **(si)**
determination of measured premolar value **(mpv)**
determination of measured molar value **(mmv):**



- CALCULATED PREMOLAR VALUE **(CPV):** or the expected arch width in the premolar region is determined by:

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

- CALCULATED MOLAR VALUE **(CMV):** or expected arch width in the molar region is determined by:

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

INFERENCE

If the measured value is less than the calculated value, then the arch is narrow for the given sum of incisors width and expansion can be done.

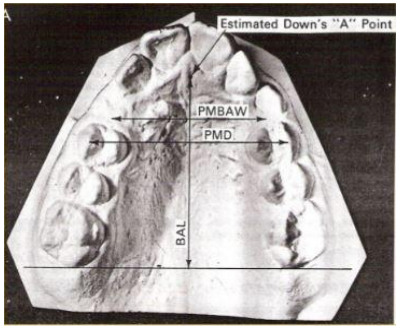
If the measured value is greater than the calculated value, the arch is wider and there is no scope for expansion.

Draw backs

- Maxillary laterals are the teeth most commonly missing from the oral cavity.
- *Peg-shaped laterals can be seen.*
- The analysis was done from the casts of French population
- It does not take skeletal mal-relationships into consideration.

ASHLEY HOWE ANALYSIS

Ashley Howe considered the crowding of teeth to be the result of deficiency in arch width rather than arch length



MIXED DENTITION ANALYSIS

- *The purpose of mixed dentition analysis is to evaluate the amount of space available in the arch for succeeding permanent teeth and necessary occlusal adjustments.*
- Methods of analysis of arch length during mixed dentition

i. Those in which the sizes of unerupted cuspids and premolars are estimated from radiographic images.

ii. Those in which the sizes of cuspids & premolars are derived from the knowledge of already erupted permanent tooth in the mouth.(Probability Tables).

iii. Combination of the above two methods.

In all of the commonly used mixed dentition analysis, the mandibular permanent incisors have been chosen for measuring, since they are erupted into the mouth early in the mixed dentition, easily measured accurately and they are directly in the midst of most space management problems.

The maxillary incisors are not used in any of the predictive procedures since they show too much variability in size and their correlation with other groups of teeth are of low predictive values. Therefore, the lower incisors are measured to predict the sizes of the upper as well as lower cuspid and bicuspid teeth.

HUCKABA'S MIXED DENTITION ANALYSIS (RADIOGRAPHIC METHOD)

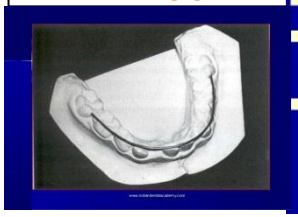
- This analysis makes use of a radiograph and study cast to determine the width of unerupted teeth. (Easy, practical & relatively accurate. / Chances of distortion of radiographic image).
  - It is based on the principle that if we measure an object, which can be seen both in radiograph as well as on a cast, then we can compensate for the enlargement of the radiographic image
  - A simple proportional relationship can be established as follows:

$$\frac{\text{Actual width of primary molar (X1)}}{\text{Apparent width of primary molar (X2)}} = \frac{\text{Actual width of unerupted premolar (Y1)}}{\text{Apparent width of unerupted premolar (Y2)}}$$

or

$$Y1 = \frac{X1 \times Y2}{X2}$$

NANCE-CARYES MIXED DENTITION ANALYSIS



- LA + 2(X) + 3.4 = L.D. (Linear dimension)
- L.A → Sum of Lower Anterior Teeth
- (X) → Estimated size of the two premolars and cuspid
- 3.4 → Inevitable mesial drift (1.7 mm) of the first permanent molar on each side following exfoliation of the deciduous molars.

Maxilla:

Width of Mandibular incisors	19.5	20.0	20.5	21.0	21.5	22.0	22.5	23.0	23.5	24.0	24.5	25.0
95%	21.6	21.8	22.1	22.4	22.7	22.9	23.2	23.5	23.8	24.0	24.3	24.6
85%	21.0	21.3	21.5	21.8	22.1	22.4	22.6	22.9	22.2	23.5	23.7	24.0
75%	20.6	20.9	21.2	21.5	21.8	21.0	22.3	22.6	22.9	23.1	23.4	23.7
65%	20.4	20.6	20.9	21.2	21.5	21.8	22.0	22.3	22.6	22.8	22.1	23.4
50%	20.0	20.3	20.6	20.8	21.1	21.4	21.7	21.9	21.2	22.5	22.8	23.0
35%	19.6	19.9	20.2	20.5	20.8	20.0	21.3	21.6	21.9	22.1	22.4	22.7
25%	19.4	19.7	19.9	20.2	20.5	20.8	21.0	21.3	21.6	21.9	22.1	22.4
15%	19.0	19.3	19.6	19.9	20.2	20.4	20.7	20.0	20.3	21.5	21.8	22.1
5%	18.5	18.8	19.0	19.3	19.6	19.9	20.1	20.4	20.7	21.0	21.2	21.5

Mandible:

Width of Mandibular incisors	19.5	20.0	20.5	21.0	21.5	22.0	22.5	23.0	23.5	24.0	24.5	25.0
95%	21.1	21.4	21.7	22.0	22.3	22.6	22.9	23.2	23.5	23.8	24.1	24.4
85%	20.5	20.8	21.1	21.4	21.7	22.0	22.3	22.6	22.9	23.2	23.5	23.8
75%	20.1	20.4	20.7	21.0	21.3	21.6	21.9	22.2	22.5	22.8	23.1	23.4
65%	19.8	20.1	20.4	20.7	21.0	21.3	21.6	21.9	22.2	22.5	22.8	23.1
50%	19.4	19.7	20.0	20.3	20.6	20.9	21.2	21.5	21.8	22.1	22.4	22.7
35%	19.0	19.3	19.6	19.9	20.2	20.5	20.8	21.1	21.4	21.7	22.0	22.3
25%	18.7	19.0	19.3	19.6	19.9	20.2	20.5	20.8	21.1	21.4	21.7	22.0
15%	18.4	18.7	19.0	19.3	19.6	19.8	20.1	20.4	20.7	21.0	21.3	21.6
5%	17.7	18.0	18.3	18.6	18.9	19.2	19.5	19.8	20.1	20.4	20.7	21.0

MOYER'S MIXED DENTITION ANALYSIS

It is based on the premise that there is a reasonably good correlation between the size of erupted permanent incisors and the unerupted canines & premolars. This is because a person with large teeth in one part of the mouth will have large teeth elsewhere also, as their development is controlled by the same genetic mechanism.

Here the lower permanent incisors are measured and the mesio-distal widths of unerupted permanent upper and lower canines and premolars is derived from the probability chart.

space creation

Need for space creation

To correct:

- Crowding
- Anterior proclination
- Posterior cross bite
- Anterior cross bite
- Rotated anterior teeth
- Molar relationship -
- Curve of spee -

various methods for gaining space

- Proximal stripping
- Arch expansion
- Extraction
- Distalization of molar
- Uprighting of tilted molar
- Derotation of posterior teeth
- Proclination/flaring of anteriors.

PROXIMAL STRIPPING

selective reduction of the mesiodistal width of certain teeth to create space.

The procedure is also called -

Proximal slicing, Reproximation, Disking, Slenderization

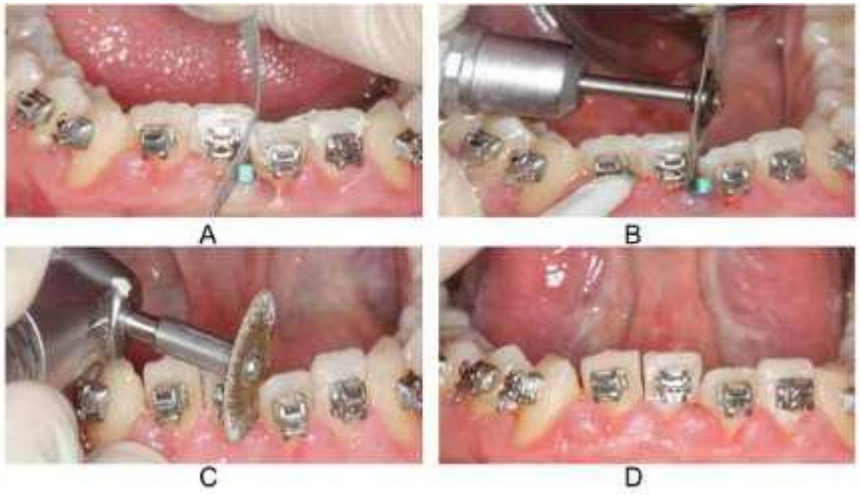
Not more than 50% of Enamel thickness to be stripped

INDICATION FOR PROXIMAL STRIPPING

- Done when space requirement is minimal (2.5-3 mm).(Or when Bolton's tooth material excess less than 2.5 mm).
- Usually when the excess exists in the mandibular anterior segment.

CONTRAINDICATIONS FOR PROXIMAL STRIPPING

- Patients who are susceptible to caries. enamel hypoplasia
- Avoided in young individual as their teeth may possess large pulp chambers.



After Reproximation there will be sensitivity.
Artificial remineralization is possible by crystal growth. A low concentration of calcium-fluoride solution

Advantages of proximal stripping

- ✓ To avoid extractions in borderline cases where space requirements are minimal.
- ✓ To achieve better interdigitation, overbite and overjet
- ✓ To broaden the contacts to add the stability of results
- ✓ Localized malalignments can be corrected without involving too many teeth, especially in adult patients.

Disadvantages of proximal stripping

≠ Sensitivity
≠ Increases caries susceptibility
≠ Difficult to reproduce exact morphology of the tooth.
≠ The shape created may not be as esthetic
≠ Food lodgement

EXPANSION

Non-invasive method of space gaining

- Undertaken in patients having constricted arch

Indications:

- Crossbite
- Crowding
- Skeletal class III malocclusion
- surgical orthodontics

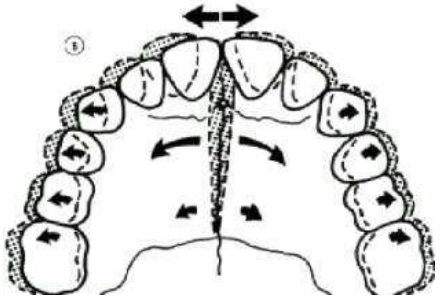
expansion devices can be classified as:

rapid maxillary expansion devices

slow expansion devices

feature	slow expansion	rapid expansion
type of expansion	mostly dental	skeletal
rate of expansion	slow	rapid
type of tissue reaction	more physiological	more traumatic
force used	milder force	greater force
frequency of activation	less frequent	more frequent
duration of treatment	long	short
type of appliance	either fixed or removal	mostly fixed
age	any age	before fusion of mid palatine suture
retention	lesser chance of relapse	more chance of relapse

Rapid maxillary expansion is also known by the terms rapid palatal expansion or split palate. It is skeletal type of expansion that involves the separation of mid-palatal suture & movement of the maxillary shelves away from each other.



RAPID MAXILLARY EXPANSION (RME) DEVICES

- First reported at 1860 by Emerson C. Angell
- These are the kind of Dentofacial Orthpedic appliance
- Mid palatine suture is mainly used to separate to gain the space
- 7-19 years of age is more Suitable time
- post. teeth are used to transmit force to the maxilla
- Midline diastema seen primarily
- Open bite is possible

Indications for RME use

. Growing individuals with severely constricted maxillary arches, Involving airway impairment or mouth breathing tendencies.

. Posterior cross bites with real or relative maxillary deficiency

. Cleft patients

Along with facemask therapy

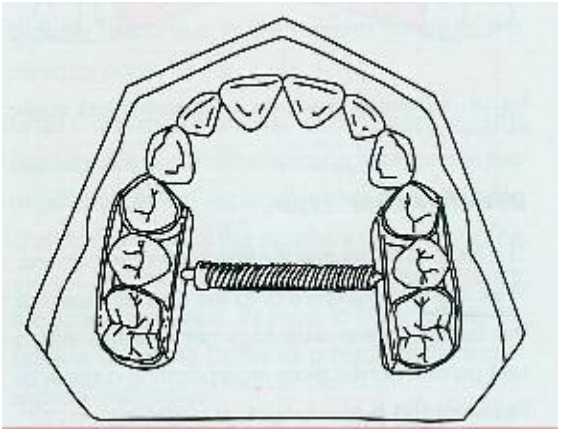
Class III cases with minor maxillary deficiency

As part of interceptive orthodontics

Tooth Born appliance are -

1. HYRAX APPLIANCES

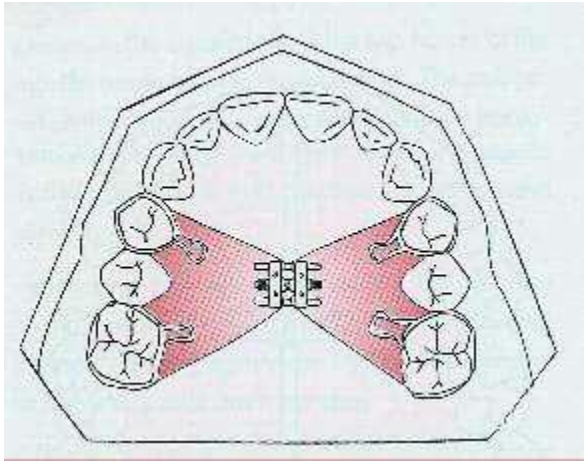
2. ISAACSON RME APPLIANCES



HASS RME APPLIANCE

Tooth-tissue born appliances

DERICHSWEILER RME APPLIANCES



Slow expansion has traditionally been termed as dento-alveolar expansion ,although some skeletal changes can be observed.

- ✓ The slower expansion have also been associated with a more physiologic adjustment to the maxillary expansion,producing greater stability & less relapse potential than in rapid expansion procedures
- ✓ The force generated by such procedures are 2-4 pounds.
- ✓ Expanded slowly at a rate of 0.5-1mm per week.

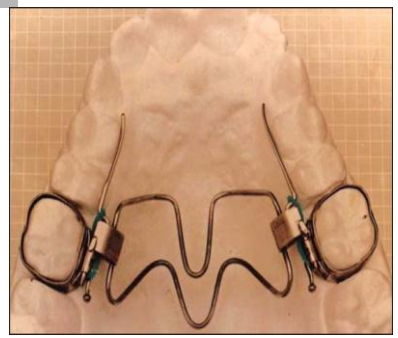
Some of them are removable, some are fixed type:

Screw appliance

Coffin Spring

QUADRI HELIX

Ni-Ti EXPANDER



DISTALIZATION OF MOLARS

Distalization procedures are aimed at moving the molars in a distal direction so as to gain space. This approach became popular due to the fact that extraction can be avoided. The ideal timing for distalization is during the mixed dentition period prior to eruption of second permanent molar.

❖**Objectives:**

1) To distalize (normalize) mesially migrated maxillary molars due to their premature mesial shift., unilaterally or bilaterally.
2) To correct mild maxillary dentoalveolar protrusion. The profile of such patient is normal or slightly protrusive at the upper lip due to dental protrusion.
3) In class I occlusion patient,distalization may be indicated to gain space to resolve minor anterior crowding.

Distalization can be done by following methods:

Extra oral approach.

Intra oral approach.

EXTRA ORAL APPROACH:

Head gear deriving anchorage from the cervical and cranial region can be used to distalize molars.

Disadvantage of extra oral method:

Patient co-operation is necessary for timely wearing the appliance. (The appliances are not usually worn for a long time. Thus they are intermitent in their action resulting in prolonged treatment time).

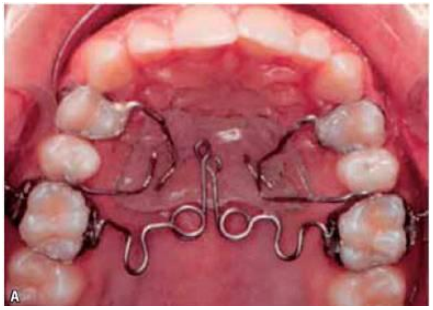
DISTALIZATION OF MOLARS

INTRA ORAL APPROACH:

This appliance was introduced to overcome the various drawbacks of extra oral methods. These appliances are fixed with tooth and therefore produce a continuous effect. The devices are:

Sagittal appliance- This appliance consist of a split acrylic plate joined with jack screw, the acrylic plate is sectioned in such a way that the tooth that to be distalized is Iisolated, and the rest of the arch is used for the purpose of anchorage.

Pendulum appliance- Introduced by HIGERS. It incorporate a modified Nance button for the purpos of anchorage.in addition it consist of a stainless steel wire with helix, the distal end of which is inserted on the palatal aspect of the molar to be distalized. Distalization is produced by opening the helix and forcefully engaging the distal end.

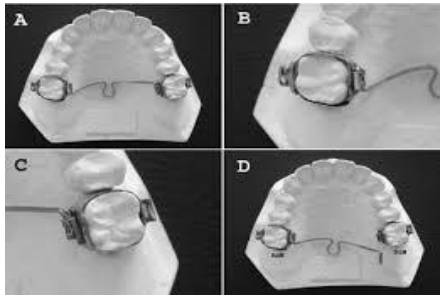


Jones jig appliance-

Jones jig is a maxillary molar distalizing appliance that utilizes a modified Nance palatal button and superelastic nickel titanium coil spring to bring about the distal force on the molar. It produce low and continuous force. Jones jig is placed on the buccal aspect of the maxillary molars.

Trans palatal arch

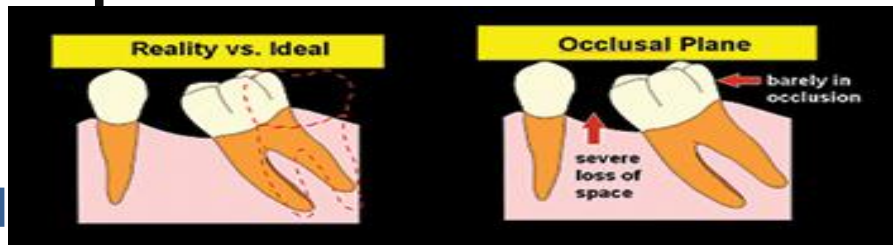
They can be used to bring about unilateral d istalization of molars.



distal jet appliance

UPRIGHTING OF TILTED MOLAR

Premature loss of deciduous second molar or extraction of second premolar can cause mesial tipping of first permanent molar.

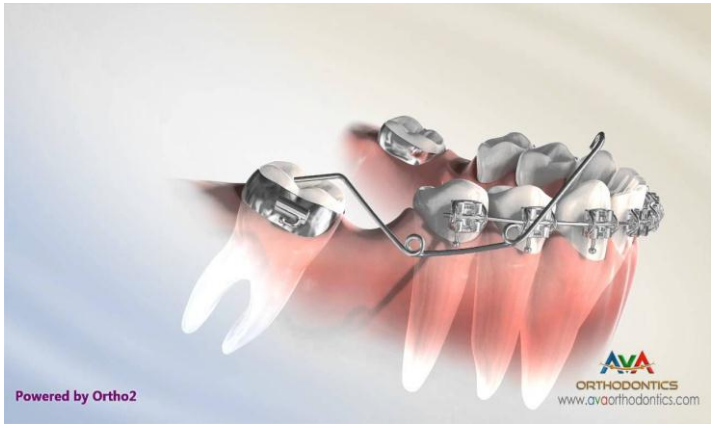


Mesially tipped molar occupy more space than an upright molar. Thus by uprighting these tipped molars certain amount of space can be recovered

UPRIGHTING OF TILTED MOLAR CAN BE DONE BY :

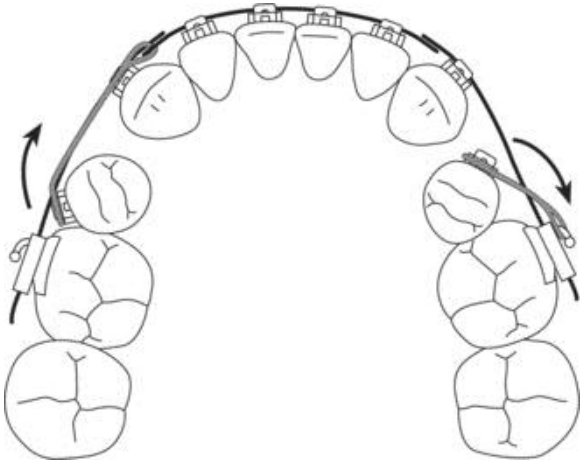
Uprighting spring.

Space regainer.



DEROTATION OF POSTERIOR TEETH

- Rotated posterior teeth occupy more space than normally placed posterior teeth.
- Derotation of of these teeth hence provide some amount of space.
- Derotation is best achieved with fixed appliance incorporating spring or elastic using a force couple.



PROCLINATION/FLARING OF ANTERIORS

PROCLINATION OF RETRUDED ANTERIOR TOOTH RESULTS IN GAIN OF ARCH LENGHT.

THIS IS USUALLY INDICATED IN :

Cases where the teeth are retroclined

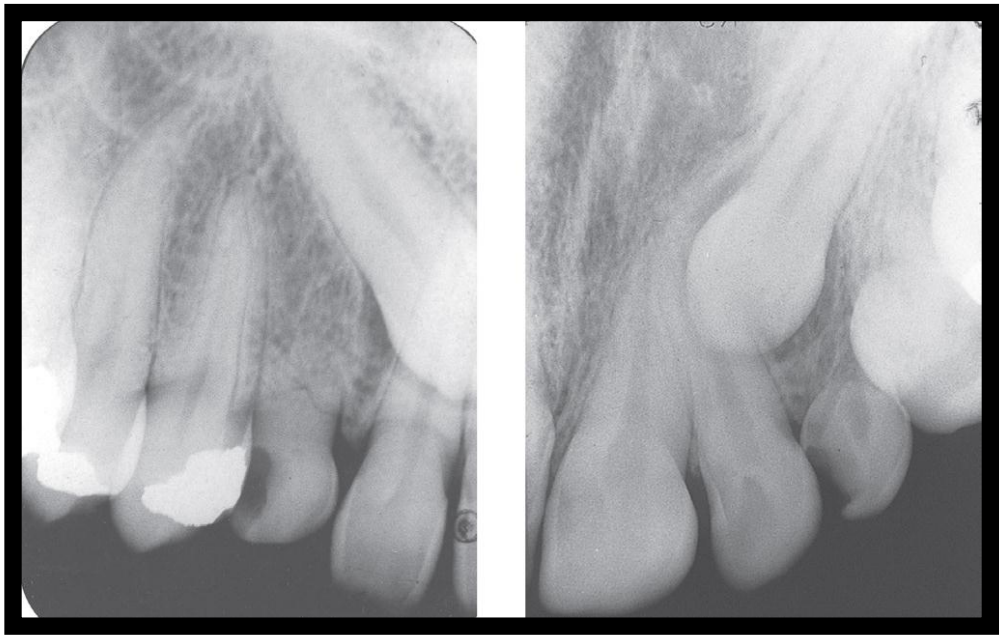
In those cases where protracting the anteriors will not affect the profile of patient.

PROCLINATION DONE BY:

Removable: Z-SPRING,T-SPRING

Fixed.

CANINE IMPACTION



Dr. Natheer

impacted tooth: completely or partially unerupted and is positioned against another tooth or bone or soft tissue so that its further eruption is unlikley : Archer (1975)

Impacted tooth is one that fails to erupt and will not attain its anatomical position beyond the chronological eruption date even after its root completion.

Impacted

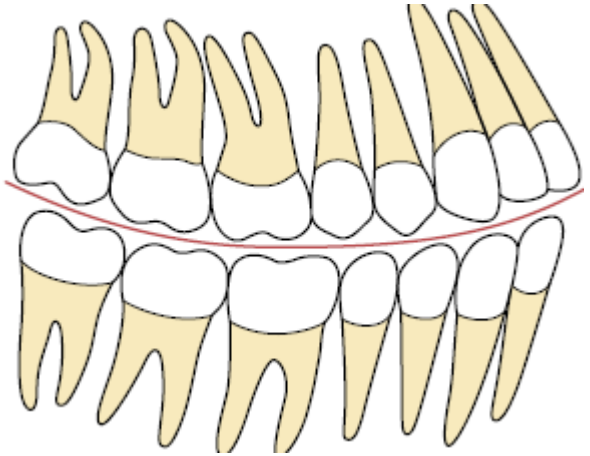
Condition of being firmly lodged (impacted in alveolar bone) so it is prevented from erupting.

Ectopic eruption

Located away from the normal position.

Canines play a role in functional occlusion and form the foundation of an esthetic smile.

Therefore, any factors that interfere with the normal development of canines and their eruption can have serious consequences.



Development of canine

4-6 months ; (calcification) begins high in the maxilla

6 years ; Crown completed

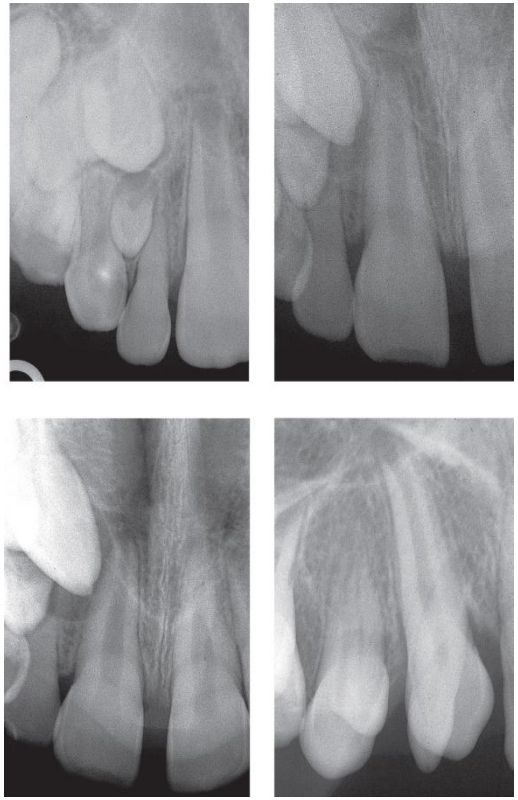
10 years ; Palpable high in the buccal vestibule

11-13years Eruption (Mandibular: 9.5years)

14 - 15 years Root completed

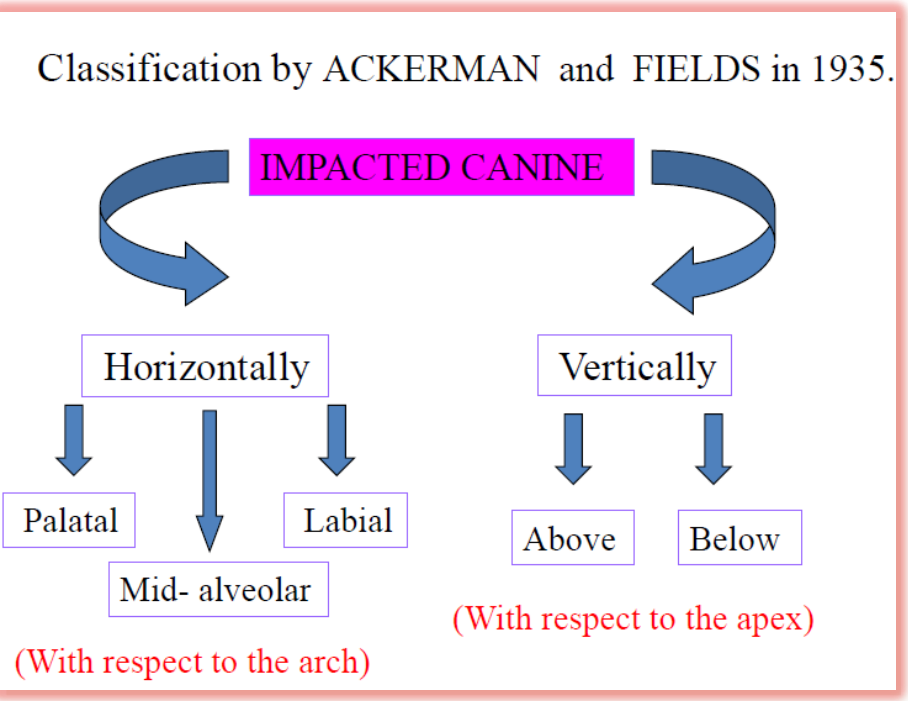
Four factors govern the Eruption of permanent canines into normal position

1. Position of tooth bud in bony Crypt.
2. Path of eruption.
3. Amount of space available for canines in the arch.
4. Shape and position of lateral incisors



Classification of impacted canine

Maxillary canine	Mandibular canine
Buccal Palatal	Buccal Lingual



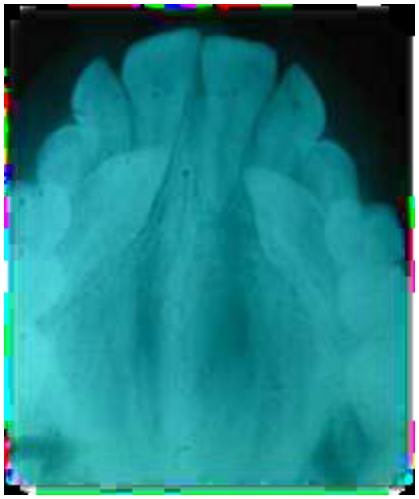
Classification of palatally impacted canine

- Based on two variables:

(1). Transverse relationship of the crown of the tooth to the line of dental arch which may be
(a) Close
(b) Distant (nearer the midline)
(2) Height of the crown of the teeth in relation to the occlusal plane which may be
(a) High
(b) Low

. The prevalence of impacted maxillary canines varies and is 1% to 3%,
with a palatal location 85% of the time and a labial location 15% of the time.

- Unlike buccal displacement of maxillary canines, palatal displacement of maxillary canines, and the frequent ensuing impaction, most often occurs in cases in which adequate perimeter arch space exists.
- Twice as common in females as it is in males.
- The incidence of canine impaction in the maxilla is more than twice that in the mandible.
- Of all patients who have impacted maxillary canines, 8% have bilateral impactions.



ETIOLOGY OF IMPACTED CANINE

Localized factors

(a) Discrepancies in tooth size-arch length (crowding),
(b) Absence of maxillary lateral incisor,
(c) Prolonged retention or early loss of the deciduous canine
(d) Abnormal position of the tooth bud (hereditary)
(e) The presence of an alveolar cleft, (hereditary)
(f) Ankylosis,
(g) Cystic or neoplastic formation,
(h) Dilaceration of the root (trauma),

Generalised causes

(a) Endocrine deficiencies,

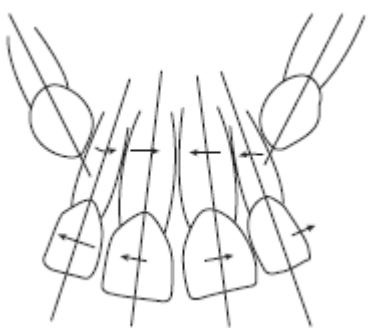
(b) Febrile diseases,

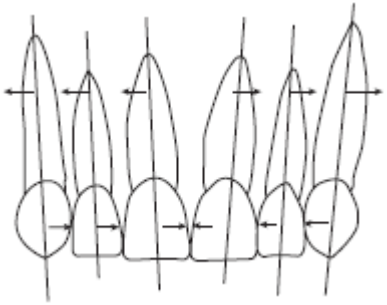
and

(c) Irradiation.

GUIDANCE THEORY

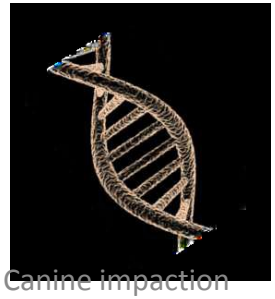
Canine erupts along the root of lateral incisors, which serve as a guide, and if the lateral incisor is absent or malformed, the canine will not erupt.





GENETIC THEORY

Genetic factors are primary origin of palatally displaced maxillary canine and include other possibly associated dental anomalies, such as missing or small lateral incisor. Given the strong hereditary influence in palatal canine displacement, there are those who believe that heredity is the direct cause and dismiss other relationships as secondary or as similarly linked hereditary factors. In other words, the palatal canine is another link in the chain of genetically linked phenomena..



Clinical Signs of Maxillary Canine Impaction

1. Failure to palpate canine bulge in buccal vestibule by 10 years
2. Immobility of the deciduous canine
3. Palatal bulge indicating possible underlying canine
4. Increased mobility, non-vital central or lateral incisors
5. Inadequate space within the dental arch for canine eruption
6. Flared lateral incisors – can also be normal
7. Asymmetry of eruption

Impacted maxillary canines in individuals > 40 years susceptible to ankylosis

SEQUELAE OF IMPACTED CANINE

- Labial or lingual malpositioning of impacted tooth
- Migration of neighbouring teeth and loss of arch length
- Internal resorption or external root resorption of impacted or neighbouring tooth
- Dentigerous cyst formation
- Infection particularly with partial eruption
- Referred pain

Clinical evaluation

Inspection -

- Non-appearance of permanent canine clinically by its eruption age.
- Presence of antimere.
- Presence of anterior spacing for a long period.
- Persistent median diastema.
- Abnormal morphology of lateral incisor or presence of peg laterals.
- Improper angulations of adjacent teeth

Palpation-

Bulge of permanent Canine could be palpated buccally above the deciduous canine 2-3 yrs before its eruption.

- It should be palpated deep above attached gingiva in the sulcus where mucosa reflects.
- Deciduous canine should be checked for mobility.
- Palpation should be done in abnormal locations after getting clue from inspection.

RADIOGRAPHIC EXAMINATION

- Indicated in individual with unerupted and non-palpable canines after the age of 11 years.
- INTRA ORAL RADIOGRAPHS;
- PA
- Occlusal
- EXTRAORAL RADIOGRAPHS;
- OPG
- Lateral cephalometric
- DIGITAL IMAGING;
- CBCT

PA: Simple, Minimal radiation exposure

1) 2D picture of 3D object
2) cannot determine bucco-lingual position of tooth & vertical position of impacted tooth.

Tube shift technique or Clarke technique

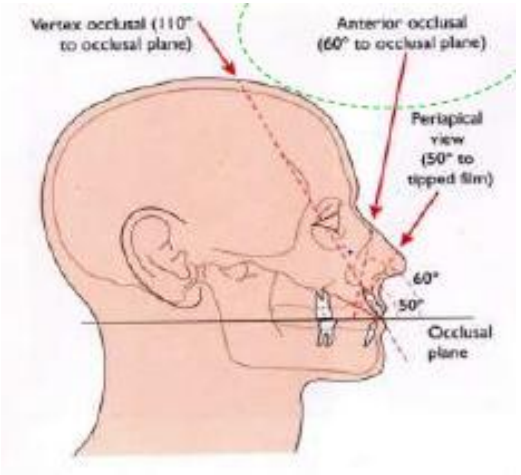
2 periapical views of the same object are taken from slightly different angles

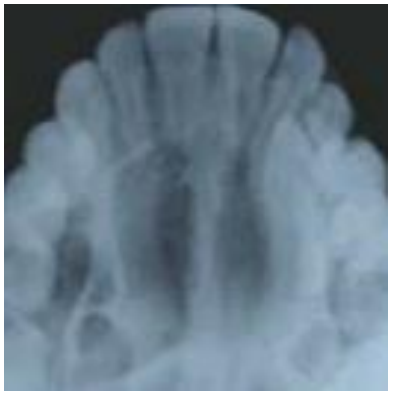
SLOB principle.

• If the object has moved on the same side as that of the X-ray tube it is lingually placed & if it has moved on the opposite side it is on the buccal side.

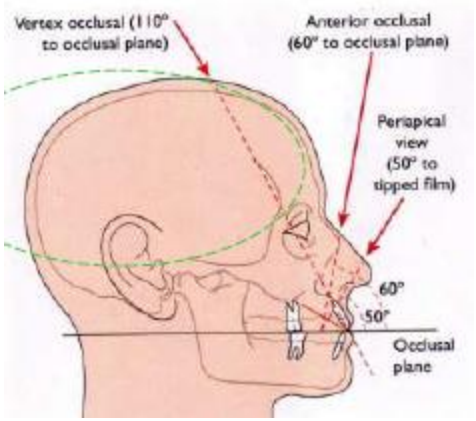
Disadvantage:
In cases when canine is highly placed, and
Periapical film shows no superimposition of canine with the roots of erupted tooth

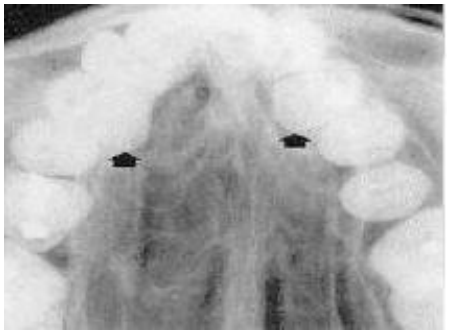
Occlusal radiograph





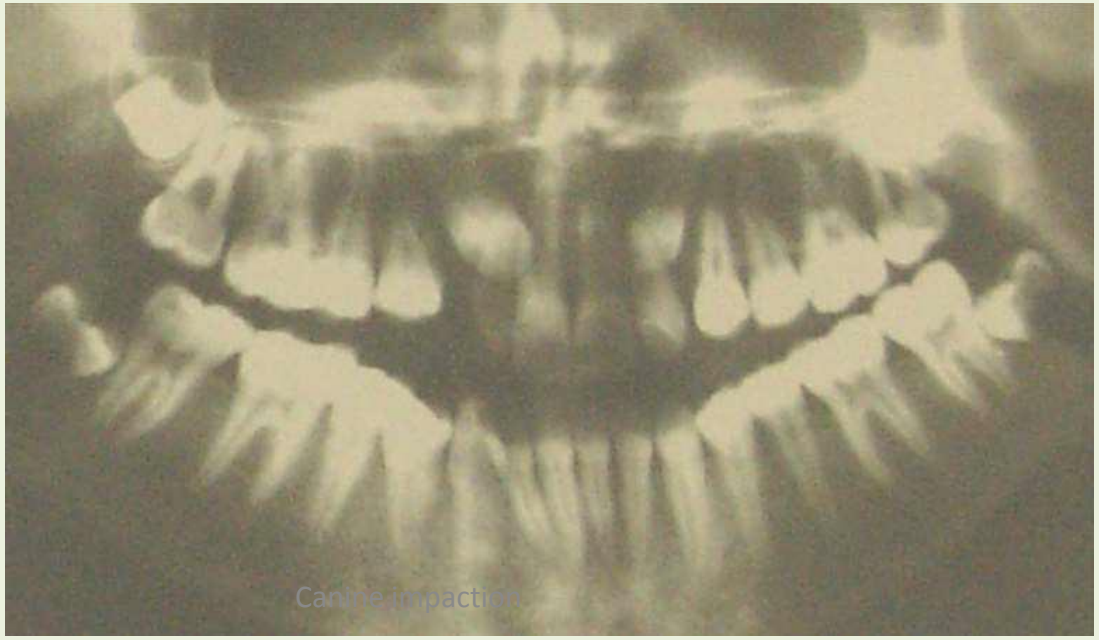
Maxillary true (vertex)/ occlusal





Mandibular occlusal

Panoramic radiographs



Lateral Cephalogram

This represent a true lateral view of the skull which defines the anteroposterior i.e mesiodistal position and vertical position of the tooth.

CT Scan

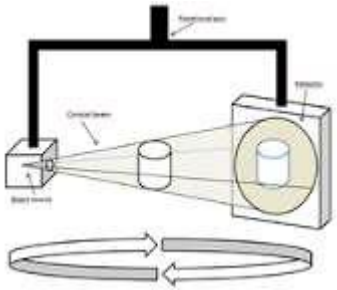
-Used to diagnose the exact position of an impacted tooth.

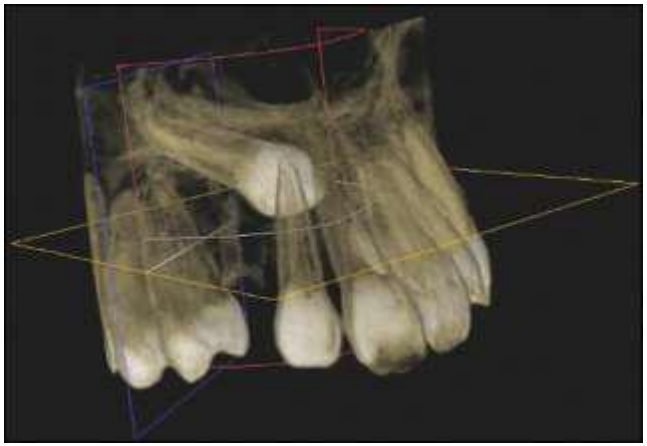
-Clear serial radiographs may be taken at graduated depth in any part of human body in this method.

CBCT

Cone beam computed tomography

It is more accurate than conventional techniques in localising impacted maxillary canines.





FACTORS INFLUENCING THE TREATMENT DECISION OF AN IMPACTED CANINE (DETERMINING THE PROGNOSIS)

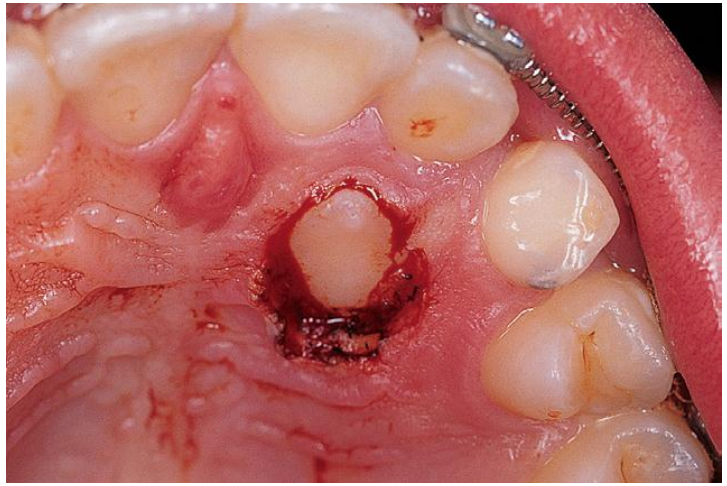
- Age of the patient.
- Availability of space.
- Favorable position of canine.
- Presence of adequate width of attached gingiva.

INTERCEPTIVE TREATMENT

- **When the clinician detects early signs of ectopic eruption of canines, an attempt should be made to prevent their impaction and its potential sequelae.**
- **Selective extraction of the deciduous canines as early as 8 or 9 years of age.**

Management

1. Most desirable approach is surgical exposure of the canine followed by orthodontic treatment.



2. Auto transplantation of the canine.

3. Extraction of the impacted canine and moving premolar in its position.

4. Extraction of the impacted canine and prosthetic replacement.

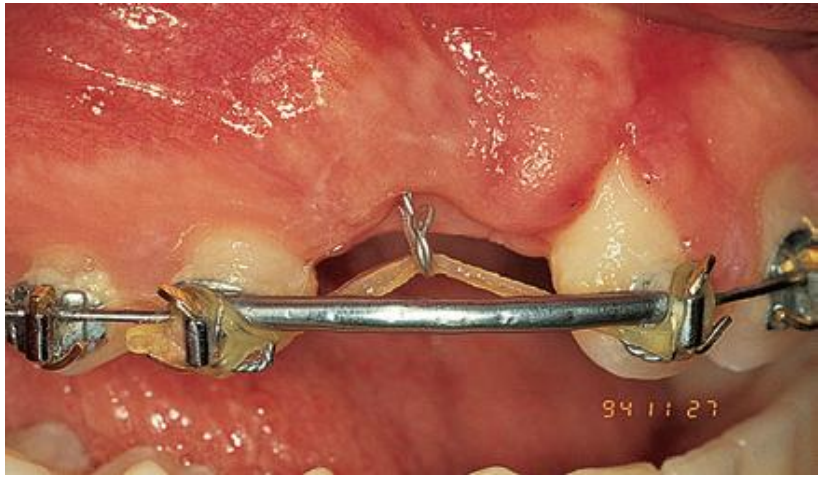
5. No treatment.

When to extract impacted Canines?

(1) If it is ankylosed and cannot be transplanted,
(2) If it is undergoing external or internal root resorption,
(3) If its root is severely dilacerated,
(4) If the impaction is severe (e.g., The canine is lodged between the roots of the central and lateral incisors and orthodontic movement will jeopardize these teeth).
(5) If the occlusion is acceptable, with the first premolar in the position of the canine and with an otherwise functional occlusion with well aligned teeth.
(6) there are pathologic changes (e.g., Cystic formation, infection).

Mechanotherapy

- Leveling and Alignment of the erupted teeth.
- Creating enough space for the impacted canine and maintaining it.
- Conversion of the arch into a rigid anchorage unit.
- Surgical exposure of the crown of the impacted canine and attachment bonding.
- Application of low force (60gm) traction from rigid anchorage unit.



Orthodontics and orthognathic surgery

Orthognathic surgery is concerned with the correction of dento-facial deformity. In the vast majority of cases a combined surgical and orthodontic approach is required to achieve an optimum result.

Indications for Orthognathic Surgery

- ✓ Severity of skeletal and dental malocclusion
- ✓ When growth modification can not be achieved
- ✓ Esthetic and psychosocial considerations
- ✓ Good general health status (mild, controlled systemic disease)

- For patients whose orthodontic problems are so severe that neither growth modification nor camouflage offers a solution, surgery to realign the jaws or reposition dentoalveolar segments is the only possible treatment.

Surgery is not a substitute for orthodontics in these patients. Instead, it must be properly coordinated with orthodontics and other dental treatment to achieve good overall results

The patient's perception of the problem

- appearance
- masticatory difficulties
- speech
- traumatic overbite
- temporomandibular joint dysfunction

CAMOUFLAGE VERSUS SURGERY

- The decision for camouflage or surgery must be made before treatment begins, because the orthodontic treatment to prepare for surgery often is just the opposite of orthodontic treatment for camouflage

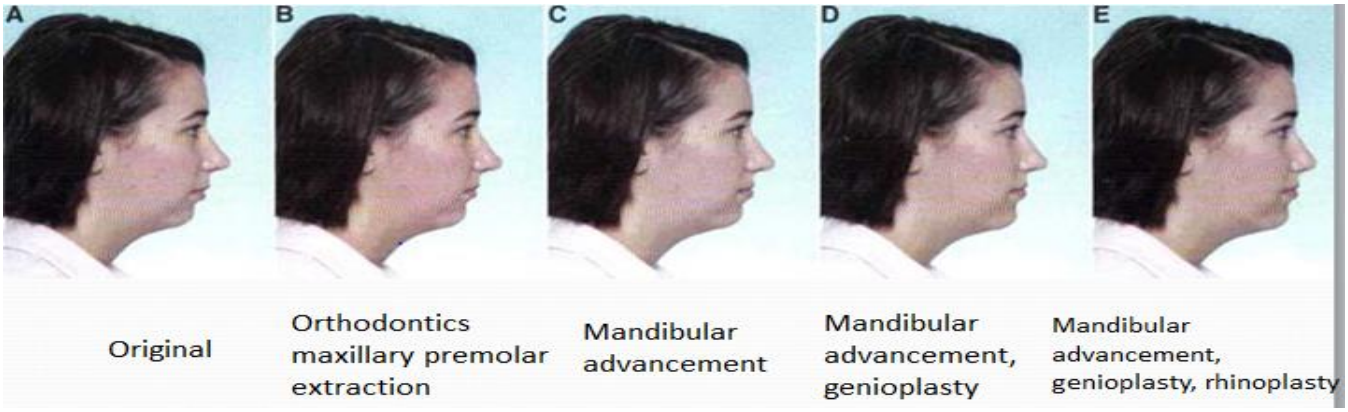
- It is a serious error to attempt camouflage on the theory that if it fails, the patient can then be referred for surgical correction. At that point, another phase of "reverse orthodontics" to eliminate the effects of the original treatment will be required before surgery can provide both normal jaw relationships and normal occlusion.

Extraction of Teeth and the Camouflage/Surgery Decision

- The critical importance of deciding on camouflage or surgery at the beginning of treatment is illustrated by the difference in extractions needed with the two approaches
- In camouflage, extraction spaces are used to produce dental compensations for the jaw discrepancy and the extractions are planned accordingly.
- Some degree of dental compensation accompanies most skeletal jaw discrepancies, even without treatment.
- If the jaws are to be repositioned surgically, this dental compensation must be removed. Otherwise, when the teeth are placed in normal occlusion, the jaw discrepancy will not be totally corrected, and dental interferences make it almost impossible to put the jaws in their proper relationship to each other

Computer Simulation of Alternative Treatment Outcomes

- It always has been a moral and ethical imperative to allow the patient to make important decisions about what treatment he or she will accept
- Computer image predictions are particularly valuable in helping patients decide between camouflage and surgery, and in planning surgical treatment.
- The patient can view the impact on the soft tissue profile of orthodontic camouflage versus surgery when these are realistic treatment alternatives
- also view the effect of varying amounts of surgical change—more or less mandibular advancement, for example, or the effect of genioplasty or rhinoplasty in addition to change in jaw position.



The characteristics of a patient who would be a good candidate for camouflage treatment are:

- **Too old for successful growth modification**
- **Mild to moderate skeletal Class II or mild skeletal Class III**
- **Reasonably good alignment of teeth (so that the extraction spaces would be available for controlled anteroposterior displacement and not used to relieve crowding)**
- **Good vertical facial proportions, neither extreme short face (skeletal deep bite) nor long face (skeletal open bite)**

Camouflage treatment designed to correct the occlusion despite jaw relationship problems <u>should be avoided in :</u>

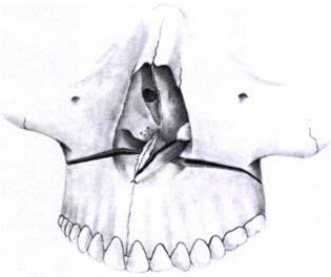
- ***Severe Class II , moderate or severe Class III , and vertical skeletal discrepancies.***
- ***Patients with severe crowding or protrusion of incisors in whom space created by extractions will be required to achieve proper alignment of the incisors.***
- ***Adolescents with good growth potential (in whom growth modification should tried first) or non-growing adults with more than mild discrepancies (in whom orthogenetic surgery usually offers better long-term results).***

COMMON SURGICAL PROCEDURES

As aesthetics are of major importance, where possible an intra-oral approach should be used to avoid unsightly scars. Segmental procedures have an increased morbidity, as damage to the teeth or disruption of the blood supply to a segment is more likely.

Maxillary procedures

- **Segmental procedures The Wassmund technique involves movement of the upper premaxillary segment of incisors and canines as a block,**
- **Le Fort I This is the most widely used technique. The standard approach is a horseshoe incision of the buccal mucosa and underlying bone, which results in the maxilla being pedicled on the palatal soft tissues and blood supply.**
- **Le Fort II to achieve mid-face advancement**
- **Le Fort III the whole mid-face including the zygomas is separated from the cranium**



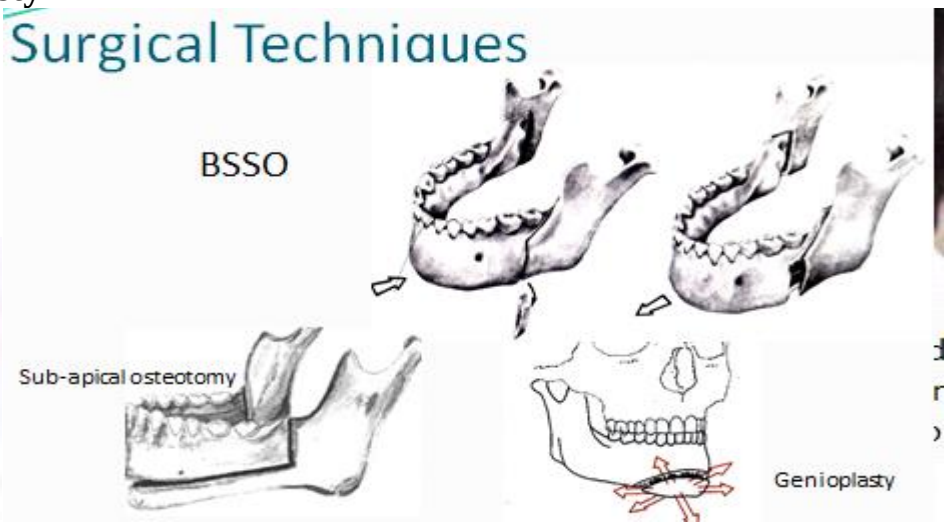
Le Fort I

Le Fort II

Le Fort III

Mandibular procedures

- **Vertical subsigmoid osteotomy**
- **Sagittal split osteotomy**
- **Sub-apical osteotomy**
- **Body osteotomy**
- **Genioplasty**



Documentation

Standard records should include:

- **a detailed description of the patients' concerns**
- **facial and dental photographs**
- **dental study casts usually based in centric occlusion**
- **an orthopantomogram (OPT) and lateral cephalogram, with a postero-anterior (PA) cephalogram for those patients presenting with an asymmetry**
- **a detailed dental history and examination**
- **a detailed medical history and examination**

Timing of Surgery

- **Usually done when all growth is complete**
- **Assessed by superimposition of serial lat cephs**
- **Can be performed when growth is not yet complete in cases of psychosocial problems or great severity when function is compromised (i.e. breathing, chewing**

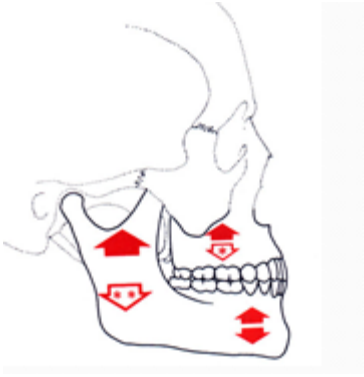
Correction of A-P relationships:

- **maxillary advancement**
- **retraction of anterior maxillary segment**
- **mandibular advancement**
- **mandibular setback**
- **double jaw surgery**

- **The maxilla and mandible can be moved anteriorly and posteriorly**
- **Anterior movements of the mandible greater than 10 to 12 mm create considerable tension in the investing soft tissues and tend to be unstable. Anterior movement of the maxilla is similarly limited to 7-8 mm in most circumstances.**
- **Posterior movement of the entire maxilla, though possible, is difficult and usually unnecessary. Instead, posterior movement of protruding incisors up to the width of a premolar is accomplished by removal of a premolar tooth on each side, followed by segmentation of the maxilla.**
- **Although the maxilla can be advanced more than it can be retracted, the possibility of relapse or speech alteration from nasopharyngeal incompetence increases with larger movements.**

Correction of Vertical Relationships

- ✓ **maxillary impaction/intrusion**
- ✓ **maxillary extrusion**
- ✓ **mandibular ramus surgery**



The surgical movements in the vertical dimension are indicated by the red arrows on this diagram of the skull. The maxilla, mandibular angles, and chin can be moved upward reliably, while downward movement of the maxilla by bone grafting is less predictable *(arrow with single asterisk).* Downward movement of the chin is possible in combination with slight advancement. Lengthening the ramus *(arrow with double asterisks)* stretches the muscular sling and usually results in relapse

Distraction Osteogenesis

- **Distraction osteogenesis is based on manipulation of a healing bone, stretching an osteotomized area before calcification has occurred in order to generate the formation of additional bone formation and investing soft tissue**
- **Distraction osteogenesis is useful for the correction of severe deformity in the growing child and it is hoped will help to reduce the number of surgical procedures previously required to treat these children.**

The advantages of distraction are that

(1) larger distances of movement are possible than with conventional orthognathic surgery, and the forces also act upon the surrounding soft tissues leading to adaptive changes termed distraction histogenesis

(2) deficient jaws can be increased in size at an earlier age.

- **<u>The great disadvantage is that precise movements are not possible</u>. With distraction, the mandible or maxilla can be moved forward, but there is no way to position the jaw or teeth in exactly a pre-planned place,**

Orthodontic Appliance Considerations

- **In contemporary surgical-orthodontic treatment, a fixed orthodontic appliance has three uses: to**

(1) accomplish the tooth movement needed in preparation for surgery;

(2) stabilize the teeth and basal bone at the time of surgery and during healing; and

(3) allow the necessary postsurgical tooth movement while retaining the surgical change

Pre Surgical Orthodontic Objectives

- ✓ **To level and align the arches and make them compatible so that the teeth do not interfere with placing the jaws in their planned relationship**
- ✓ **to resolve crowding and/or spacing**
- ✓ **to establish anteroposterior and vertical position of incisors (decompensate) to place teeth relative to their own supporting bone**
- ✓ **It is important to forewarn the patient that the presurgical orthodontic phase may make their appearance worse as any dento-alveolar compensation is reduced**
- ✓ **Presurgical orthodontics usually takes between 12 and 18 months depending upon the complexity of the case**

Preparation for Surgery

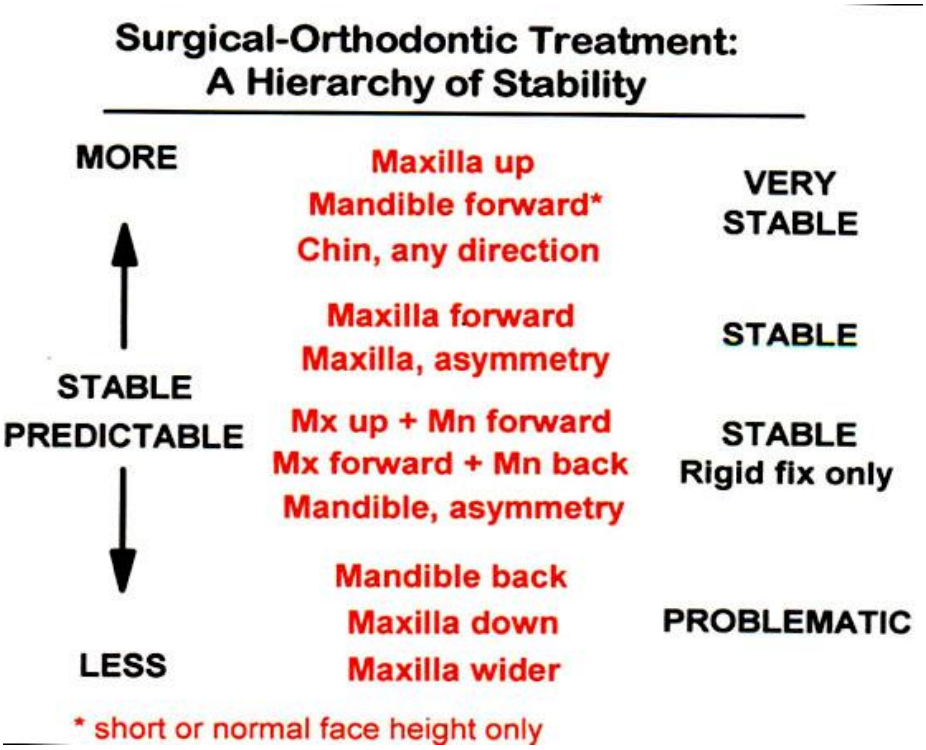
- **Removal of third molars 6 months before mandibular osteotomy**
- **Check for any TMJ problems**
- **Manipulate models mounted in an articulator to check for interferences and occlusion**
- **Model surgery is often carried out to determine the amount and site of bone removal and to fabricate inter-occlusal wafers Splint fabrication (1 or 2 splints usually 1 to 2 weeks before surgery**

Post Surgical Orthodontic Treatment

- **4-6 weeks: reinitiate orthodontic tx (after range of motion and stability are achieved) remove splint**
- **change to light wires and light vertical elastics**
- **treatment usually completed in 4 to 12 months (average 6 months)**

Relapse and Stability

- **Rigid fixation has improved stability**
- **Stability is mostly influenced by the pattern of rotation of the mandible as it is advanced**
- **Advancement of maxilla and/or mandible will stretch soft tissues promoting relapse**
- **The more advancement needed, the greater the probability for relapse**
- **patient is compliant with all aspects of treatment, particularly postsurgical wear of elastic traction**



- **In this context, very stable means better than a 90% chance of no significant postsurgical change; stable means better than an 80% chance of no change and major relapse quite unlikely; problematic means some degree of relapse likely and major relapse possible.**

- **It is interesting to note that the key procedures in surgical treatment of Class II problems (superior repositioning of the maxilla , mandibular advancement and their combination) are quite stable. In Class III treatment, maxillary advancement is the most stable procedure, while downward movement of the maxilla and mandibular setback remain problematic).**