Sri Aurobindo College of Dentistry

Indore, Madhya Pradesh

INDIA

Module plan

TOPIC : PREVENTIVE AND INTERCEPTIVE ORTHODONTICS

SUBJECT: PEDODONTICS

TARGET GROUP: UNDERGRADUATE DENTISTRY

MODE: POWERPOINT – WEBINAR

PLATFORM: INSTITUTIONAL LMS

PRESENTER: DR UPDESH MASIH

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Interceptive Orthodontics

- American Association of Orthodontists defined interceptive orthodontics as 'that phase of the science and art of orthodontics employed to recognize and eliminate potential irregularities and malposition in the developing dentofacial complex".

- According to Graber, Interceptive orthodontics refers to the "Measures undertaken to intercept a malocclusion that has already developed or is developing and the goal is to restore a normal function".

- According to Ackerman and Proffit (1980), interceptive orthodontics can be defined as "Elimination of existing interferences with the key factors involved in the development of the dentition".

Serial Extraction

History

Year	Name	Findings
1600s	Paisson	The 1st person who pointed the extraction procedure in order to improve the irregular alignment and crowding of teeth.
1743	Bunon	In his "Essay of the disease of the teeth" he proposed the removal of deciduous teeth to achieve a better alignment of permanent teeth.
1929	Kjellgren	Coined the term serial extraction to describe a procedure where some deciduous teeth followed by permanent teeth were extracted to guide the rest of the teeth in normal occlusion.
1940	Nance	Presented clinics on his technique of "progressive extraction" and has been called as the father of the serial extraction philosophy in United states.
1941	Hotz	Named the procedure 'Guidance of eruption'. According to him, this term is comprehensive and encompasses all measures available for influencing tooth eruption.

Definition

- Serial extraction describes an orthodontic treatment procedure that involves the orderly removal of selected deciduous and permanent teeth in a predetermined sequence.

  (Dewel, 1969)

- Serial extraction describes an interceptive orthodontic procedure usually initiated in the early mixed dentition when one can recognize and anticipate potential irregularities in the dentofacial complex and is corrected by a procedure that includes the planned extraction of certain deciduous teeth and later specific permanent teeth into a more favourable position.

- Serial extraction can be defined as the correctly timed removal of certain deciduous and permanent teeth in mixed dentition cases with dentoalveolar disproportion in order to alleviate crowding of incisor teeth, allow unerupted teeth to guide themselves into improved positions; lessen (or eliminate) the period of active appliance therapy.

PRINCIPLES OF SERIAL EXTRACTION

Arch Length : Tooth material Discrepancy

- Whenever there is an excess of tooth material as compared to the arch length, it is advisable to reduce the tooth material in order to achieve stable results.

- This principle is utilised in serial extraction procedures where tooth material is reduced by selective extraction of teeth so that the rest of the teeth can be guided to normal occlusion.

Physiologic Tooth Movement

- Human dentition shows a physiologic tendency to move towards an extraction space. Thus by selective removal of some teeth, the rest of the teeth are guided by the natural forces into the extraction spaces.

- Thus by selective removal of some teeth which are in the process of eruption are guided by the natural forces into the extraction spaces.

INDICATIONS

- Premature loss of deciduous teeth
- Arch length deficiency and tooth size discrepancy
- Absence of physiologic spacing
- Lingual eruption of lateral incisors
- Unilateral deciduous canine loss and midline shifting
- Canines erupting mesial to the lateral incisor
- Mesial drift of buccal segment
- Abnormal eruption direction and eruption sequence

- Gingival recession on labially displaced incisors
- Flaring, ectopic eruption, ankylosis etc
- Abnormal or asymmetric primary canine root resorption
- Crowded maxillary and mandibular incisors with extreme labial proclination
- Deleterious oral habits
- Class I malocclusion showing harmony between skeletal and muscular system
- Midline shift potential due to unilateral canine loss
- Abnormal primary canine root resorption

CONTRAINDICATIONS

- Congenitally absent/missing lower second premolars
- Extensive caries of permanent first molars
- Severe class II and class III malocclusions of dental as well as skeletal origin
- Unilateral congenital absence of teeth
- Abnormal tooth size, shape, colour
- Cleft lip and cleft palate cases

- Reverse overjet, deep bite, open bite, rotation, gross malposition, crossbite
- Spaced dentition
- Class I malocclusion with minimal space deficiency
- Mild disproportion between arch length and tooth material that can be treated by proximal stripping

ADVANTAGES

- Treatment is more physiologic as it involves guidance of teeth into normal positions making use of the physiologic forces
- The removal of deciduous canine allows spontaneous alignment of crowded incisors which simplify later appliance treatment
- The extraction of first premolar before crowding allows permanent canines to drift into natural alignment without any appliance
- It lessens the period of future appliance therapy and cost of treatment

- Psychological trauma associated with malocclusion can be avoided by treatment of the malocclusion at an early age
- Better oral hygiene is possible thereby reducing the risk of caries
- Health of investing tissues is preserved
- Lesser retention period is indicated at the completion of treatment

DISADVANTAGES

- It cannot be applied in Class II and III malocclusion cases.
- Psychological trauma
- If extractions are carried out too early, this result in space loss or delayed eruption of permanent successors
- Lower permanent canines may erupt ahead of first premolar into extraction space of the first deciduous molar, impacting premolar and making its removal difficult

- Quite frequently patients require appliance treatment
- There is no single approach that can be universally applied to all patients
- Each patient has to be assessed and a suitable extraction timetable has to be planned
- Treatment time is prolonged as the treatment is carried out in stages spread over 2-3 years. It requires the patient to visit the dentist often.
- As extraction spaces are created that close gradually, the patient has a tendency of developing tongue thrust.

Technique and Stages in Serial Extraction Therapy

1. Diagnosis and treatment plan
2. Removal of deciduous canine
3. Removal of first deciduous molars
4. Removal of erupting first premolars

1. Diagnosis and treatment plan

- Deciding on the timing and the sequencing for extracting primary and permanent treatment is the key to success. The technique of serial extraction usually involves a period of incisor adjustment followed by a period of canine adjustment.
- Diagnostic records are obtained
- The diagnosis exercise prior to treatment should involve comprehensive assessment of the dental, skeletal and soft tissues.
- Study model analysis should be carried out to determine the arch length discrepancy

- Carey's analysis in the lower arch and arch perimeter analysis in the upper arch should be carried out. Mixed dentition analysis helps in determining the space required.
- The eruption status of the dentition is evaluated from an OPG.
- The skeletal tissue assessment should involve comprehensive cephalometric examination to study the underlying skeletal relation.
- The soft tissue assessment by clinical examination and cephalograms help in the diagnosis.

2. Removal of deciduous canine

- The purpose is to permit the eruption and optimal alignment of lateral incisors. It prevents the mesial migration of canines into severe malposition.
- The four deciduous canines are removed as upper permanent lateral incisors are erupting
- The alignment of incisors should improve at the expense of space for permanent canine.

3. Removal of 1st Deciduous Molar

- They are removed in order to encourage the early eruption of first permanent premolar.
- Most successful if premolar roots have half formed (at about 9.5 years of age). It is desirable that the 1st premolar should erupt in advance of canines, although this is not often in the case of lower arch.

It is sometimes done earlier in the mandible than maxilla to enhance early eruption of lower 1st premolar, either of two procedures should be carried out :-

- In a combined procedure, extract deciduous 1st molars and surgically remove the unerupted permanent 1st premolar
- To avoid the surgical procedure, extract the deciduous mandibular 1st molars and approximately 6 months later, remove the deciduous mandibular 2nd molars. This allows the unerupted 1st premolar to move distally in the alveolar bone as the canine erupts.

4. Removal of erupting 1st Premolars

- When the upper permanent canine has just emerged through oral mucosa, the 1st premolar should be extracted.
- This is the most important stage of serial extraction procedure, and it is essential to recheck that the case is suitable for treatment by extraction of 1st premolars.
- All teeth must be present and sound, and the permanent canines must be mesially inclined. There must be crowding sufficient to justify the extraction of 1st premolars.

Tweed's technique for Serial Extraction

At 8 years, all 1st deciduous molars are extracted

Maintain the deciduous canine to retard the eruption of permanent canine

After 4 to 10 months, extract all four erupting first premolar teeth along with all four deciduous canines

Canines and incisors are aligned

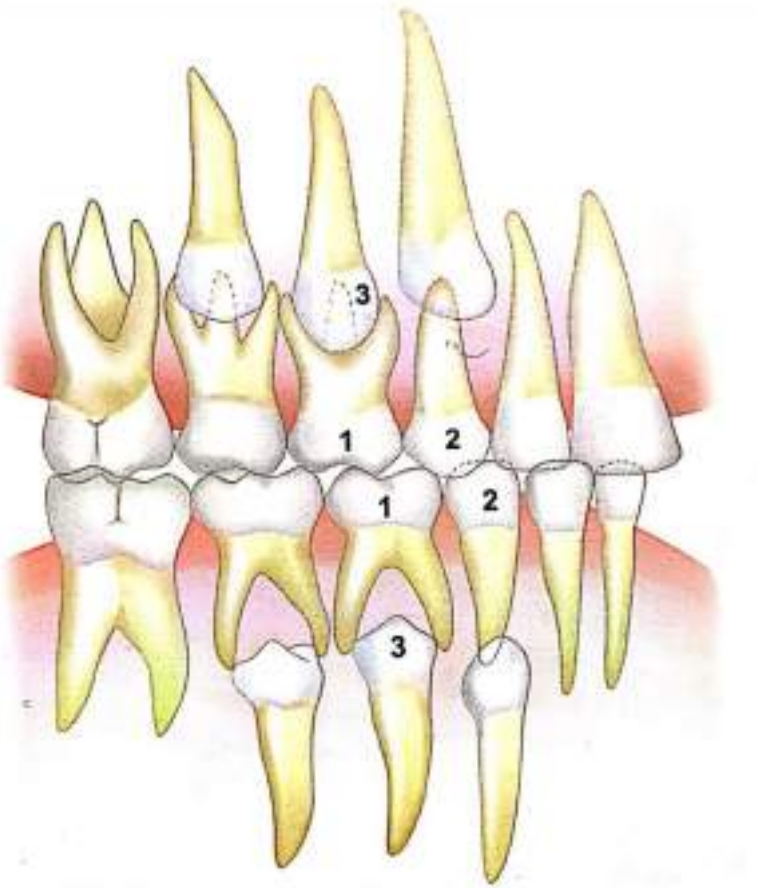

Fig. 36.1: Tweed's method of serial extraction D-C-4.

Dewel's Method

At 8-9 years of age, deciduous canines are extracted.

After 1 year, deciduous 1st molars are extracted.

Eruption on 1st premolar is accelerated.

Extraction of 1st premolars.

Canines erupt in alignment.

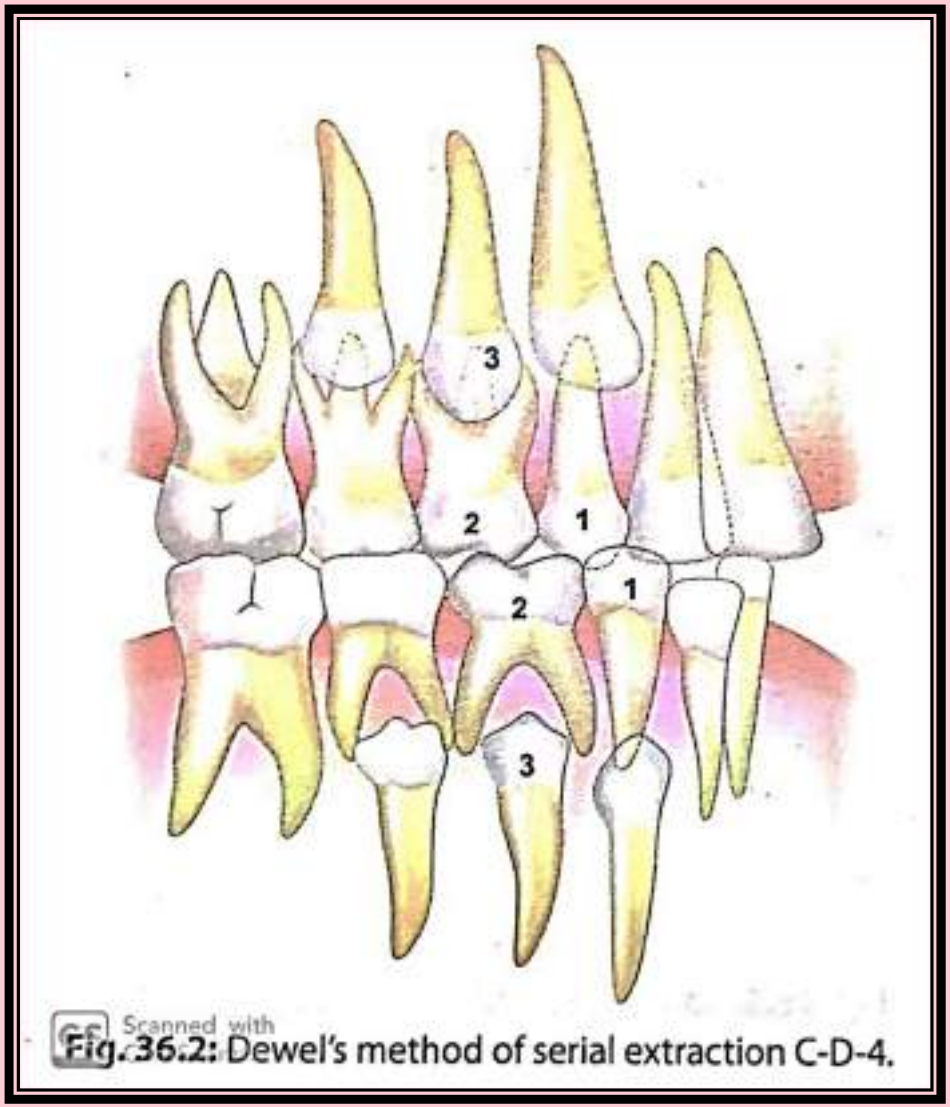

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Fig. 36.2: Dewel's method of serial extraction C-D-4.

Nance's Method of Serial Extraction

- Extraction of all deciduous first molars
- Extraction of all 1st premolars
- Extraction of deciduous canines
- Canines are in alignment

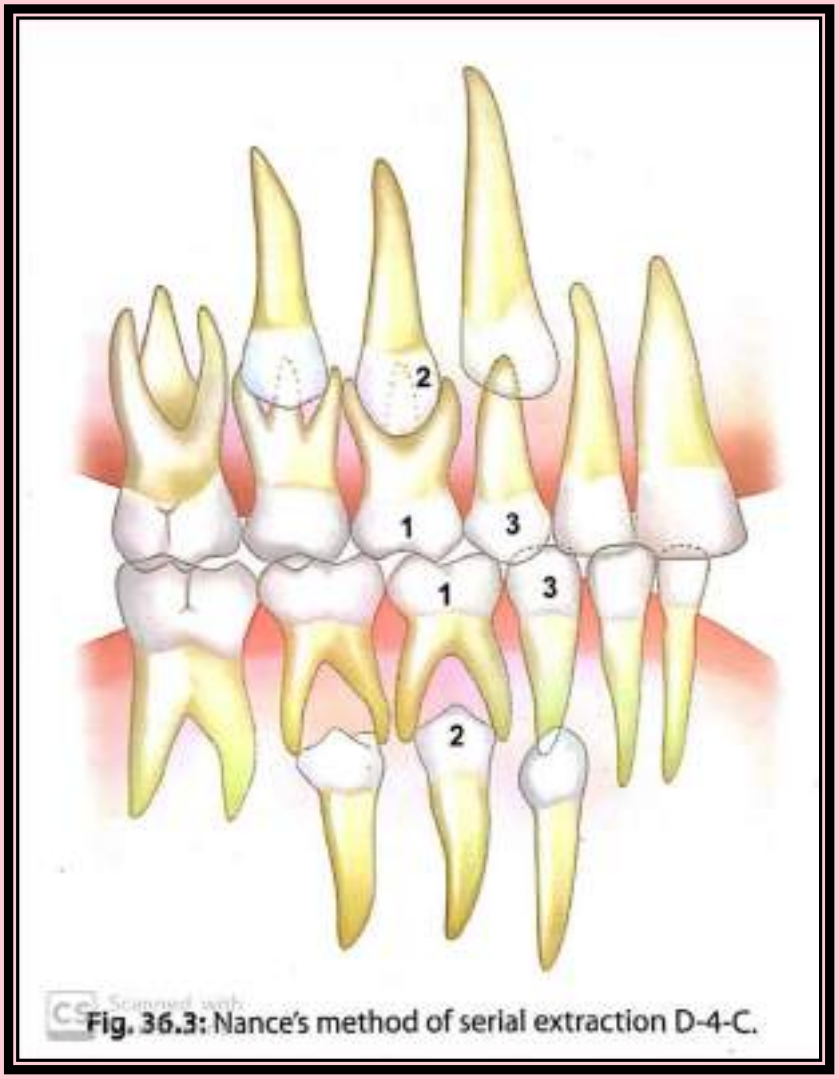


Fig. 36.3: Nance's method of serial extraction D-4-C.

Moyer's Method of Serial Extraction

- Extract all deciduous lateral incisors
- Wait for 7-8 months, extract all deciduous canines
- Extraction of all deciduous 1st molars
- After 7-8 months, extract all 1st premolars
- Provide space and align canine

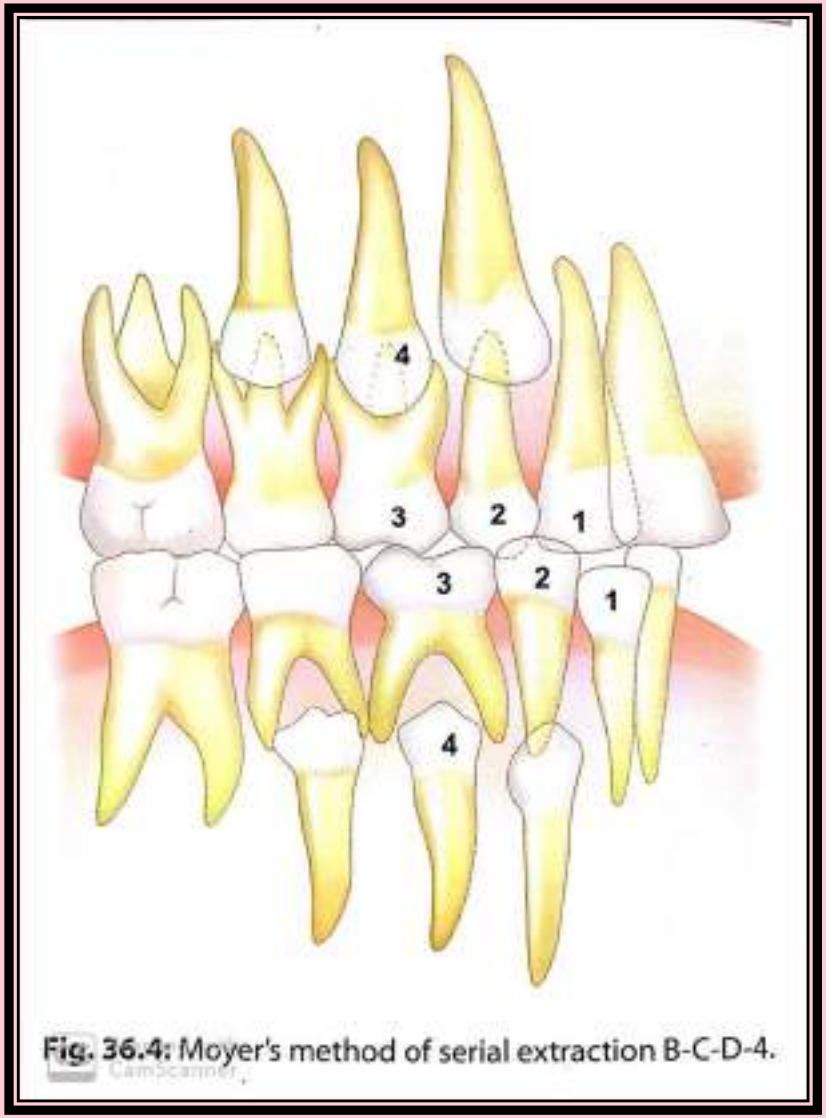


Fig. 36.4: Moyer's method of serial extraction B-C-D-4.

Role of a Pedodontist

- Pedodontist and orthodontists are mutually dependent on each other's skill for treatment planning of serial extraction.
- The ideal plan for the Pedodontist is to observe the problem, take an appropriate decision and refer the patient to orthodontist.
- Pedodontist will proceed with planned sequence of extraction.
- The Pedodontist will thus share in decision making process, and the orthodontist does not have a reason to question the decision.

CROSS BITE

- Graber defined crossbite as a condition where one or more teeth may be abnormally malposed buccally or lingually or labially with reference to the opposing tooth or teeth.

- Anterior crossbite is defined as reversed labiolingual relationship between one or more maxillary and mandibular teeth.

- Posterior crossbite is an abnormal buccolingual relationship of tooth or teeth in maxilla or mandible, or both, when the two dental arches are brought into centric relation.

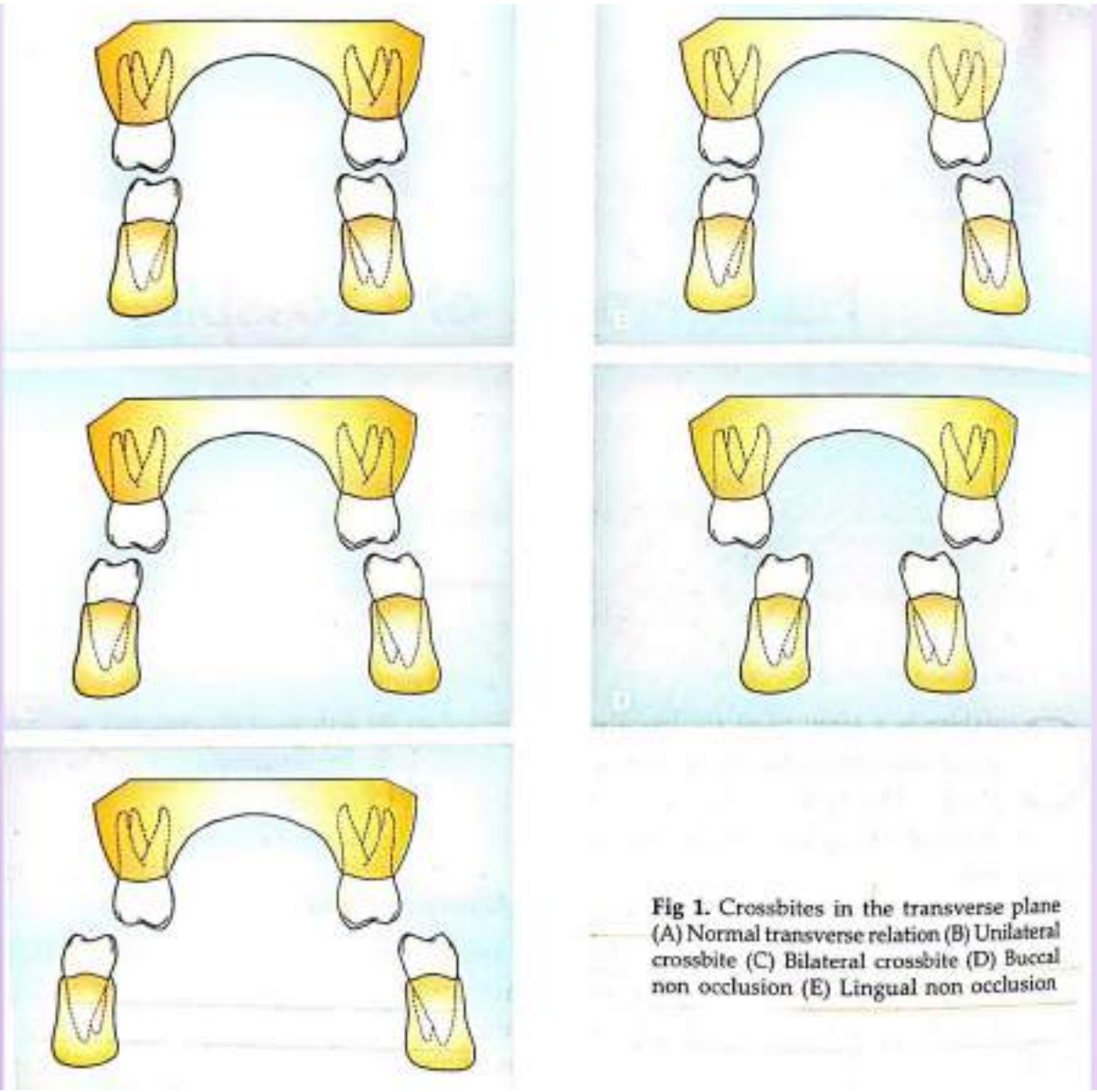
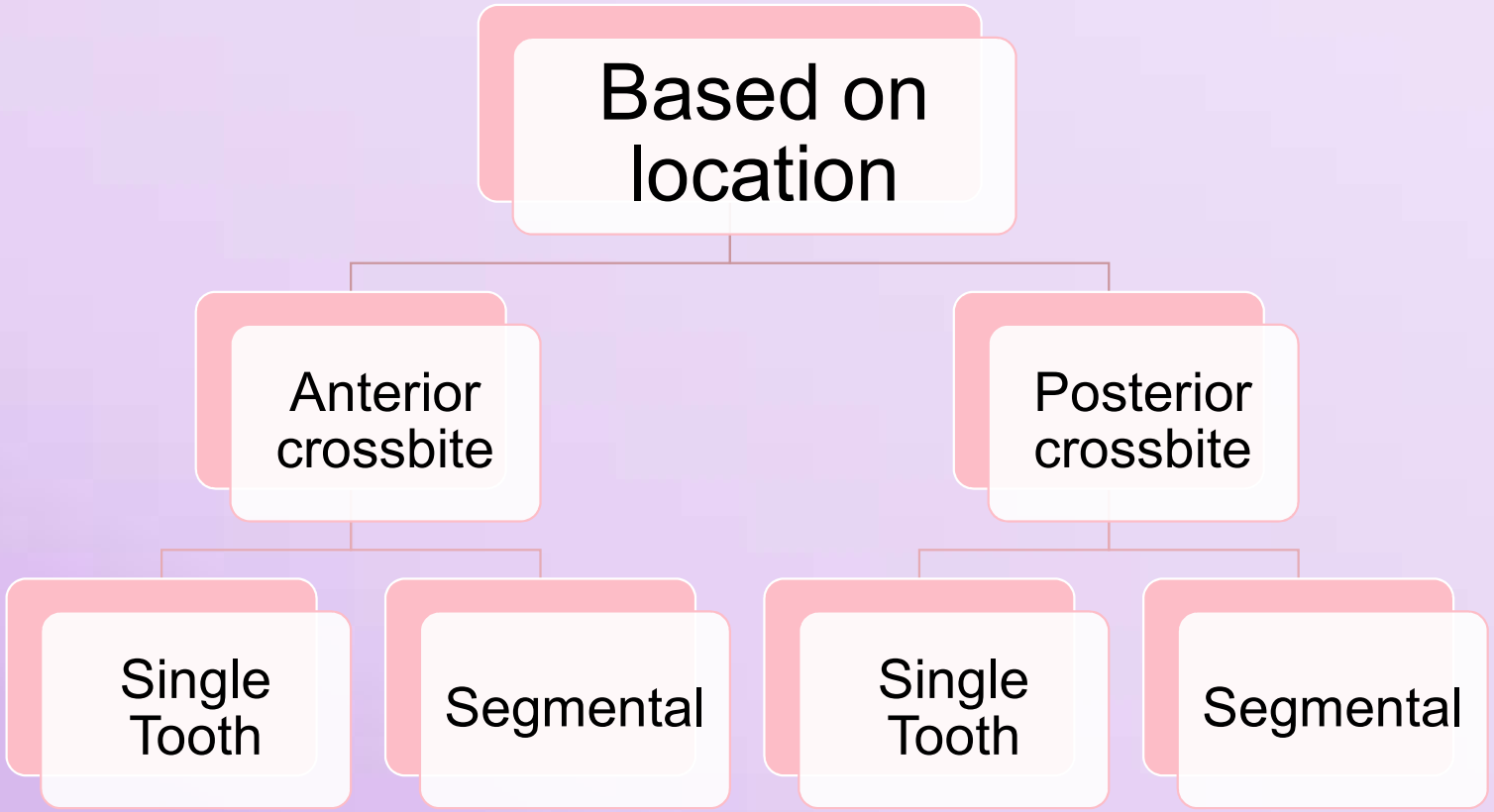


Fig 1. Crossbites in the transverse plane (A) Normal transverse relation (B) Unilateral crossbite (C) Bilateral crossbite (D) Buccal non occlusion (E) Lingual non occlusion

Fig 2. (A) , (B) and (C) Single tooth anterior crossbite. (D) Crossbite involving the two lateral incisors. (E) and (F)Anterior segmental crossbite. Note the amount of crowding in the arch. Provision should be made in the treatment plan for space to move the maxillary anterior teeth labially. Moderate or severe crowding may necessitate extraction of teeth to gain space.

Classification of Crossbite



Possible causes of Crossbite

	Anterior Crossbite	Posterior Crossbite
Developmental (dental/skeletal)	▪ Tooth size-jaw discrepancy ▪ Anteroposterior skeletal discrepancy due to excessive abnormal mandibular growth ▪ Palatal eruption of permanent tooth due to over retained primary tooth ▪ Cleft palate	▪ Transverse discrepancy between maxilla and mandible ▪ Cleft palate and other malformations of head and neck ▪ Ectopic eruption of permanent 1st molar

	Anterior Crossbite	Posterior Crossbite
Pathology	▪ Supernumerary tooth ▪ Presence of cyst, fibroma, tumour causing palatal discrepancies of tooth ▪ Traumatic injury to primary dentition causing lingual displacement of permanent tooth bud	▪ Unilateral condylar hypo-/hyperplasia ▪ Juvenile rheumatoid arthritis ▪ Scarring post trauma
Soft tissue influence and habits	▪ Lip biting/lip sucking habit ▪ Neonatal intubation ▪ Decreased muscle tone	▪ Neonatal intubation ▪ Non nutritive sucking ▪ Adaptive swallow behaviour ▪ Mouth breathing habit ▪ Decreased muscle tone
Functional	▪ Due to premature contact during centric closure	▪ Functional shift to achieve maximum intercuspation

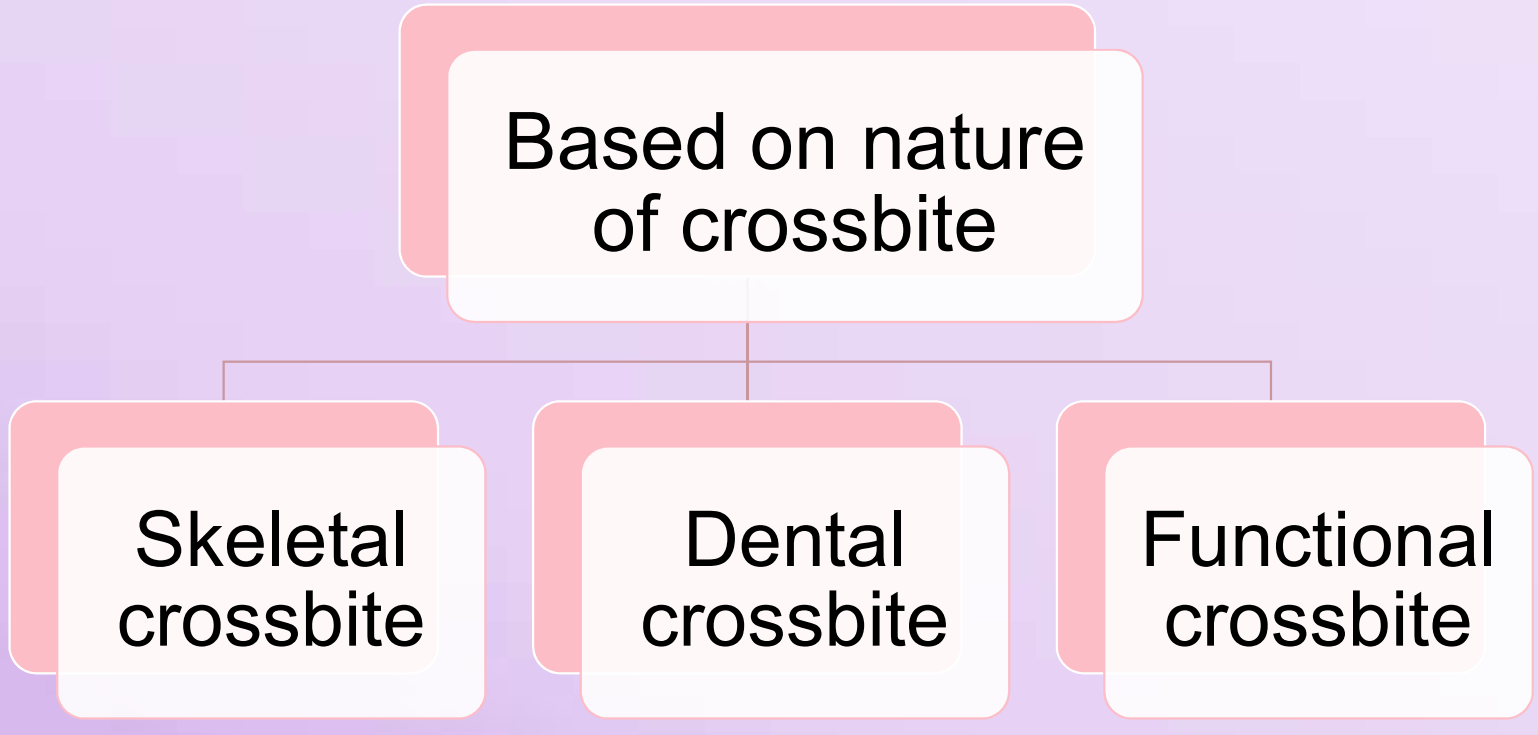
Following considerations influence decision making on interception of anterior cross bite

- The aetiology of crossbite : dental or skeletal
- Presence of functional shift of the mandible
- Number of teeth in cross bite
- Mesiodistal space required for the alignment of tooth in cross bite
- Crowding and space available for the alignment of lower incisors
- The extent of root formation and dental development of the affected teeth
- Associated habits such as mouth breathing and tongue thrusting
- Status of oral hygiene and dental caries and any retained deciduous tooth or presence of root stumps

Interception & Correction of Developing Anterior Crossbite

- Anterior crossbite is a condition in which one or more maxillary anterior teeth are in lingual relation to the mandibular teeth.
- Anterior crossbite should be intercepted and treated at an early stage because it is self perpetuating condition which if not treated early has the potential of growing into skeletal malocclusion and might at a later stage require major orthodontic treatment combined with surgical procedures.

Anterior crossbite is of three type



i. Dentoalveolar Anterior Crossbite

- This is often manifested as single tooth crossbite and usually occurs due to over retained deciduous teeth.
- The most common appliance used for it's correction is posterior bite plane with z spring.

- Tongue Blade therapy

- The blade is placed in such a manner that it rests on the mandibular incisors opposing the tooth in crossbite, and the patient is asked to bite with a constant pressure on the tongue blades.
- If there is adequate space for the tooth in crossbite to moved into the correct position, the tooth can be guided with the help of tongue blade.

❑ Catalan's Appliance

- It is used to correct the crossbite of young patients whose permanent molars have not erupted and deciduous molars are lost.
- It is used on lower anteriors where the appliance makes use of muscle forces and guide erupting tooth in normal positing.
- When appliance is worn, the teeth can come in contact only in the anterior region during masticatory functions and hence correct the crossbite. It is constructed at 45 degree angulation on the lower incisors by acrylic or cast metal. A removable appliance of this type requires nearly fulltime wear to be effective and efficient.

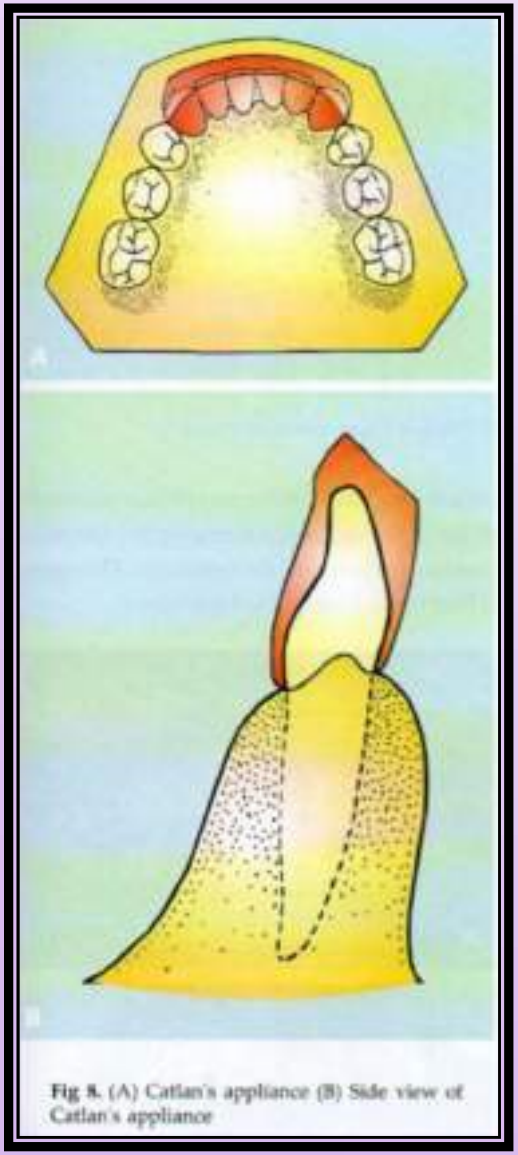


Fig 8. (A) Catlan's appliance (B) Side view of Catlan's appliance

❑ Fixed Appliance

It is also possible to tip the appliance the maxillary incisor forward with a 2 x 4 appliance and fixed mechanotherapy. This may be the best choice for a somewhat older mixed dentition patient with crowding, rotations and more permanent teeth in crossbite.

Stainless steel crown

A reverse stainless steel crown is best suited for single tooth crossbite in which the lower mandibular incisors have been previously displaced labially.

❑ Quad Helix

In case of bilateral anterior cross bite where both the maxillary lateral incisors are in crossbite, fixed expansion appliance is used to correct the crossbite in lateral incisors.

The free ends of anterior arms of the quad helix must contact the lateral incisors for the desired movement of the lateral incisors.

It is a fixed maxillary expansion appliance which is fabricated using molar bands and 0.038" Elgiloy wire.

Parts of the appliance are

i. Anterior bridge
ii. Anterior loop
iii. Palatal bridge
iv. Posterior loop
v. Anterior arms

Activation of quad helix

1. Extra Oral Activation
   - This is done by opening the helix.
   - Anterior helix is opened to do posterior expansion and posterior helix is opened for lateral movement of anterior arms thereby bringing about anterior palatal expansion.
   - Expansion of 5 mm is done on each molar side and 1.5 mm in anterior region.

2. Intra Oral Activation
   - It Is done by using three pong plier.
   - Anterior bend is placed on the anterior bridge by keeping the single prong anteriorly to bring about the posterior expansion.
   - Posterior bend is placed on the palatal bridge by keeping single prong towards the midline to bring about anterior expansion.

ii. Functional Anterior Crossbite

- The presence of occlusal prematurities deflect the mandible into a more forward path of closure. So this type of crossbite results from the functional shift of the mandible.
- These are commonly seen in pseudo class III type of malocclusion and are treated by eliminating the occlusal prematurities.

❑Occlusal Equilibration

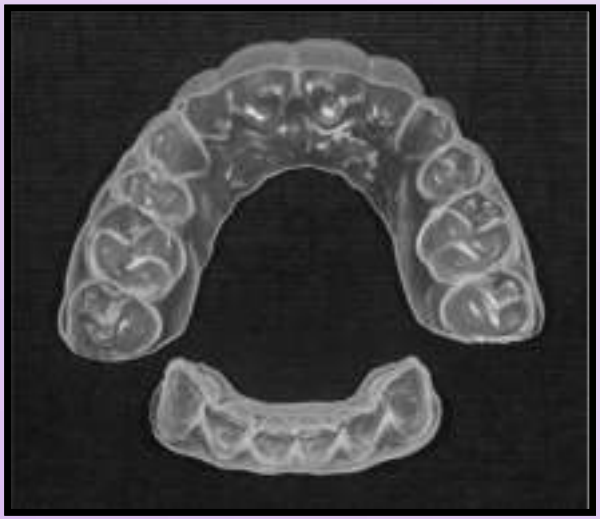
- Correction of pseudo class III anterior crossbite resulting from premature contact may require careful alteration of premature tooth contact by incisal grinding.
- Care should be taken to preserve the anatomy of the teeth and not to cause sensitivity.

iii. Skeletal Anterior Crossbite

- Occurs due to skeletal discrepancies in growth of maxilla or mandible.
- This type of crossbite usually involves the whole segment instead of one or two teeth.
- It can be because of maxillary retrognathism or mandibular prognathism or both.

Alternative modalities for anterior crossbite correction

Essix appliance described by Sheridan in 1993 is an aesthetic removable appliance thermoformed from plastic polyester material and is invisible, inexpensive and quickly fabricated. It has minimum bulk, superior strength, retained without clasps, and does not interfere with speech of function.



Sheridan JJ, LeDoux W, McMinn R. Essix retainers: fabrication and supervision for permanent retention. Journal of clinical orthodontics: JCO. 1993 Jan;27(1):37-45.

- Liepa et al. in 2008 described a simple functional appliance for the correction of anterior crossbite involving several teeth called Bruckl Appliance.
- It was constructed using mandibular Hawley retainer, inclined plane added to Hawley's retainer and labial bow for retraction of lower incisors.
- The inclined plane stimulate the forward movement of maxillary incisor which are in crossbite. When activated labial bow acrylic is cut away on the lingual surface of mandibular incisors, the labial bow exerts a retrusive force to upright lower incisors, close spaces, and correct anterior crossbite.

Fig. 10. Steps in fabrication of Bruckl appliance: A-C – acrylic plate with inclined plane in wax; D, E – appliance is ready for using.

Jirgensone I, Liepa A, Abeltins A. Anterior crossbite correction in primary and mixed dentition with removable inclined plane (Bruckl appliance). Stomatologija. 2008;10(4):140-4.

- Planas Direct Technique has been reported to treat anterior and posterior crossbites in the primary dentition.
- PDT are build with composite on the primary molars guiding the mandible to slide backward and permitting the tongue to deliver an appropriate force on the maxillary incisors.

Fig. 4 PDTs bonded to deciduous molars.

Ramirez-Yañez GO. Planas direct tracks for early crossbite correction. Journal of clinical orthodontics: JCO. 2003 Jun;37(6):294.

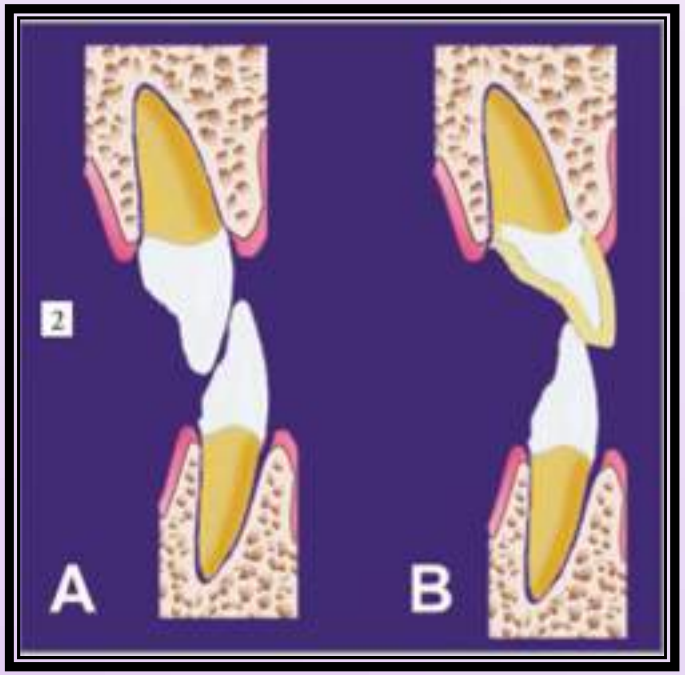
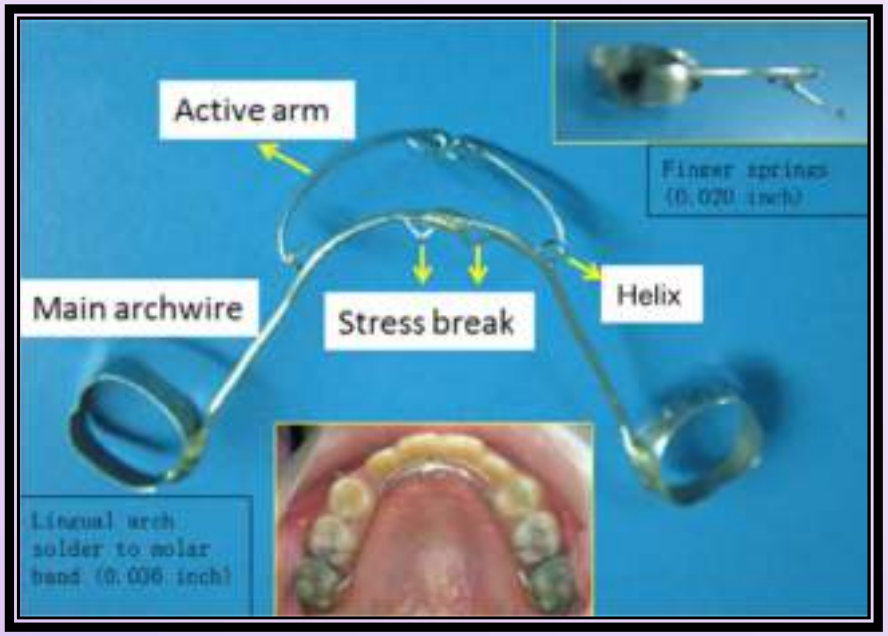


Figure 1. Photographs of clinical case no. 1 showing: (A) the anterior crossbite before treatment; (B) the primary maxillary incisors re- stored with pediatric strip crowns; (C) the crossbite corrected 1 week after treatment; and (D) stable occlusion of the primary dentition 6 months after treatment.
Figure 2. Diagram showing how to change the axial axis of the primary maxillary incisors to correct an anterior crossbite in the primary dentition. (A) Before treatment; (B) direction of the pediatric crown placement.

Ramirez-Yañez G. Treatment of anterior crossbite in the primary dentition with esthetic crowns: report of 3 cases. Pediatric dentistry. 2011 Jul 15;33(4):338-41.



The appliance components were a lingual arch (0.036 inch), molar band, and finger springs (0.020 inch). The lingual arch was adapted to the linguogingival surfaces of the teeth. The finger springs comprised stress break, helix, and active arm components. The stress breaks absorbed force and prevented the breaking of wire from the soldering site. The helices were bent for increasing the resilience of the wire. The active arms were placed on the gingival side of crossbite teeth.

Cheng HC, Shih MJ. Dentofacial changes after anterior crossbite correction using a lingual arch with finger springs. Journal of Dental Sciences. 2017 Mar 1;12(1):70-7.

❑ Composite Inclines

Build up a composite incline on lower teeth directly in the patient's mouth. Croll (1999) has suggested the use of a bonded compomer slope based on the assumption that a compomer having less strength than a composite can easily be removed when desired.

Compomer slope, bonded in place, establishes overbite relationship and elongated inclined plane.

Compomer slope removed in five weeks. Crossbite corrected as seen in this view, nine months after treatment

Case II. Bonded compomer slope for anterior tooth crossbite correction. Pediatric dentistry. 1999;21(4).

❑Removable Hawley's appliance using jack screw

- A maxillary Hawley's appliance with jack screw can be used to correct anterior cross bite involving all maxillary incisors.
- Before using the appliance, it should be diagnosed whether the anterior cross bite is dental or skeletal.
- Skeletal crossbite may require use of face mask therapy along with intraoral appliance.
- The appliance can be activated by giving a quarter turning the jack screw everyday.

Interception & Correction of Developing Posterior Crossbite

Aetiology

The posterior cross bite of dental origin with a narrow maxilla may be solely due to vertically growing face in a child with mouth breathing habit, recurrent throat infections and with a severe thumb sucking habit.

Posterior crossbite of skeletal origin such as those seen with maxillary hypoplasia, large mandible in skeletal class III relationship and those with operated patients with cleft lip and palate.

Interceptive Measures and Appliances

i. Occlusal Equilibration
   - A dental crossbite in the primary or mixed dentition caused by functional interferences can be corrected by simply removing occlusal interferences.
   - These interferences are most often seen in the cuspids.

ii. Cross elastics

Agarwal A, Mathur R. Segmental orthodontics for the correction of cross bites. International journal of clinical pediatric dentistry. 2011 Jan;4(1):43.

Coffin Spring

- It was designed by Walter Coffin.
- It is a removable appliance that contains of an omega shaped wire of 1.25 mm diameter placed in the mid-palatal region.
- The free ends of the omega are embedded in an acrylic plate that covers the slope of the palate.
- The spring brings back the dentoalveolar expansion.
- However, it is capable of skeletal changes when use din young patients.

iii. Removable Hawley's Appliance

- A removable maxillary Hawley's appliance with a jackscrew embedded in the acrylic resin is used for unilateral/bilateral dental crossbite.
- The activation of the screw is done one quarter (0.25 mm) once a week or twice every week.
- The lateral expansion of maxilla can be facilitated by avoiding cuspal interferences of the buccal teeth in crossbite by either addition of bite plane in the appliance or by instituting glass ionomer turbo on the molars.
- After the correction of crossbite, the appliance should be worn for an additional 3-6 months. The midline palatal split in appliance is sealed with cold cure acrylic. This adds rigidity to the appliance and disallows any further expansion.

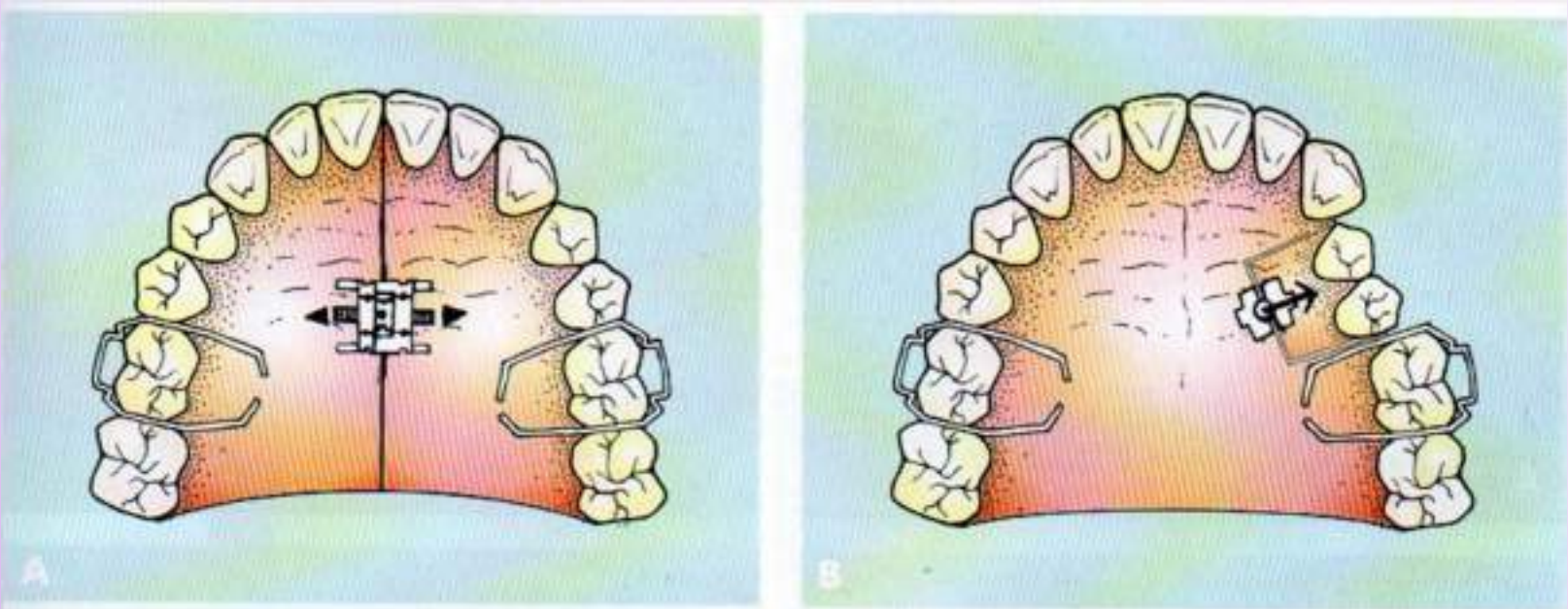


Fig 16. (A) Removable appliance incorporating a midline expansion screw for bilateral expansion in the treatment of bilateral posterior crossbite. (B) Unilateral crossbites treated using removable appliances incorporating jackscrews. The plate is sectioned in such a way that a small segment and larger segment are formed. The two segments are connected by one or more jackscrews. The smaller segment of the plate adjoins the area in crossbite whereas the larger segment is used for anchorage.

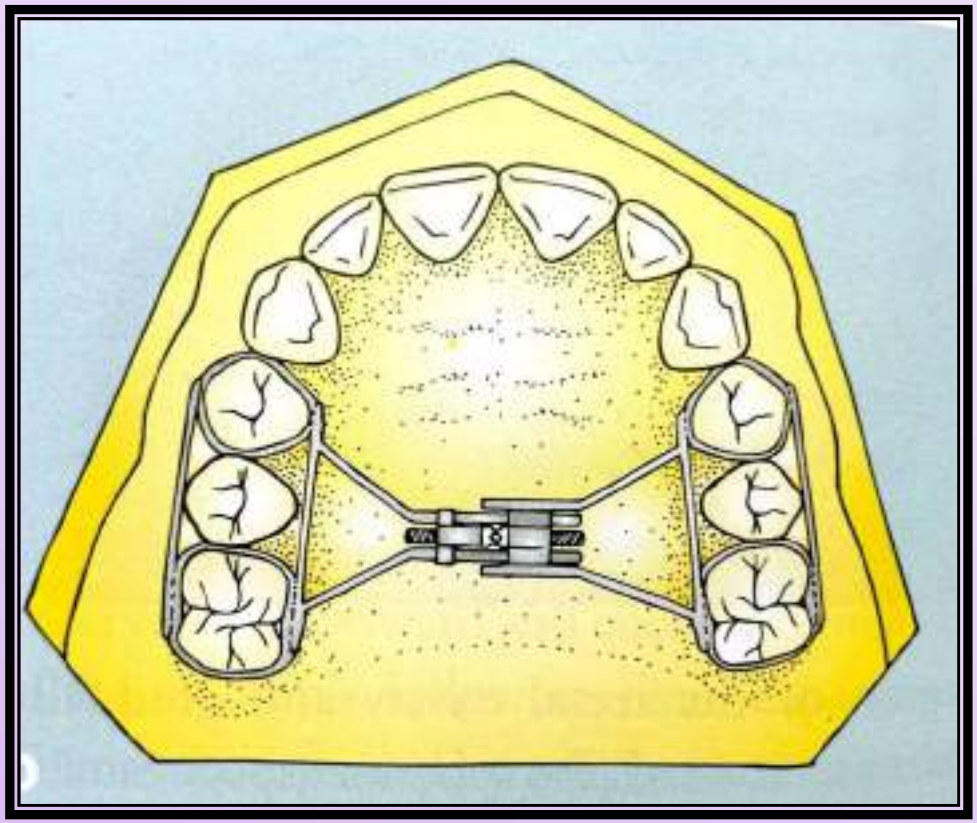
- W arch appliance and Quad helix appliance

- The fixed slow expansion appliance is attached to the lingual tube on the first molars.
- Quad helix is a modification of W arch.
- Addition of four helical f=gives better control of teeth and range of force applied.

Skeletal correction of posterior crossbite

Rapid maxillary expansion (RME)

- It can be achieved through rapid rate of expansion in a removable expansion screw or with HYRAX type of expander.
- The rate of expansion is 1 mm/day divided in two instalments. The instalments usually last for 7-10 days.
- The expansion is done for two quarter turn (0.5 mm).
- The orthopaedic forces causes a mid line split of maxilla leading to appearance of mid line diastema, a sign of successful RME therapy.
- The diastema will spontaneously close with recoiling of stretch supracrestal fibres after expansion procedure is stopped.
- After expansion, midline screw is sealed with light cure composite for a period of 3 – 6 months as a retention device.



HYRAX type of rapid maxillary expansion appliance

Fig 15. Hyrax appliance used for rapid maxillary expansion. (A) & (B) Pre-expansion (C) & (D) Post-expansion. Note the midline diastema.

NJ1

Interceptive Orthodontics

Dr. Nivedita Jain
2nd Year MDS

Slide 72

NJ1 Nivedita Jain, 26-12-2019

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Open Bite

Open bite is a malocclusion that occurs in vertical plane, characterized by lack of vertical overlap between the maxillary and mandibular dentition.

Aetiologic factors are :-

- Digit sucking habit
- Lip and Tongue habit
- Nasopharyngeal Airway obstruction
- Skeletal growth abnormalities
- Pathological open bite
- Muscular dystrophy

1. Digit sucking habit

- Prolonged thumb sucking habit.

  The posture of thumb repositioning, the intensity, the frequency of sucking and the age of the patient of the patient all have an influence on the nature and severity of open bite.
- Malocclusion characterised by an asymmetric open bite due to digit position and a transverse constriction of the maxillary arch due to lowered tongue pressure.
- The severity of the malocclusion correlates better with the number of hours per day of sucking than the magnitude of pressure.

2. Lip and Tongue habit

- Tongue thrusting is also implicated for some cases of open bite.
- According to Proffit and Mason, tongue thrust is more likely to be an adaptation to the open bite than being cause of open bite.
- Profitt suggests that the resting position of the tongue may have greater influence on tooth position and open bite than tongue thrust.
- When the tongue is naturally kept in forward position, overlying the lower incisors it predisposes to an open bite.

3. Nasopharyngeal Airway obstruction

Facial appearance of these patients are referred to as Adenoid facies

- Cheek are narrow
- Nostrils are narrow and pinched
- Incompetent lips
- Exaggerated shadows beneath eyes
- Protruding teeth
- Open mouth
- Dull expression

4. Skeletal growth abnormalities

- Inherited factors such as increased tongue size, abnormal skeletal growth pattern of the maxilla and mandible.
- Genetic and environmental influences that encourage vertical growth in molar region, which is not compensated by growth at the condyle or posterior ramus.
- Subjects with open bite have shorted rami and greater total facial height with clockwise rotation of the mandible.

5. Muscular Dystrophy

It has been noticed that a decreased in tonic muscle activity allows the mandible to rotate downward resulting in increased anterior facial height, a posterior growth rotation of the mandible, excessive eruption of posterior teeth, narrowing of maxillary arch and anterior open bite.

6. Pathological open bite

7. Iatrogenic open bite

Anterior Open Bite

It is a condition where there is no vertical overlap between the upper and lower incisors.

Classification of Anterior open bite

a. Skeletal anterior open bite – developed due to excessive vertical growth, worsen with growth and usually require a combination of orthodontic and orthognathic surgery.

b. Dental anterior open bite – may close spontaneously in a growing patient and generally amendable to orthodontic treatment.

Clinical features of Skeletal open bite

- Increased lower anterior facial height
- Increased anterior and decreased posterior facial height
- Decreased upper anterior facial height
- A steep mandibular plane
- The patient may have a short upper lip with excessive maxillary incisor exposure
- Long and narrow face of patient
- Anterior open bite
- Tend to exhibit class II malocclusion and mandibular deficiency. They may have small mandibular body and ramus
- Crowding in lower arch
- Narrow maxilla and posterior cross bite

Cephalometric features of Skeletal open bite

- Downward and backward rotation of the mandible
- An upward tipping of the maxillary skeletal base
- Vertical maxillary height increased
- Steep palatal plane and increased percentage of lower facial height
- Excessive eruption of maxillary posterior height
- Excess eruption of maxillary and mandibular incisors
- Divergent cephalometric planes

Features of dental anterior open bite

- Proclined upper anteriors
- The upper and lower anteriors fail to overlap each other resulting in a space between maxillary and mandibular incisors
- The patient may have narrow maxillary arch due to lowered tongue posture due to a habit.

Treatment of Anterior Open Bite

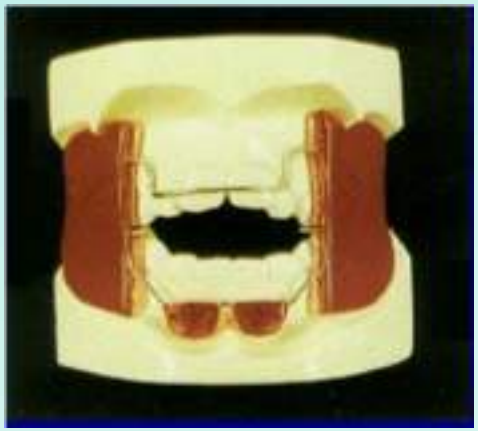
1. Removal of the cause

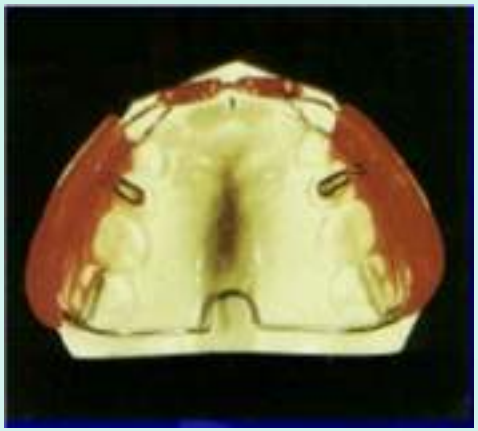
Removable habit breaker

Fixed habit breaker

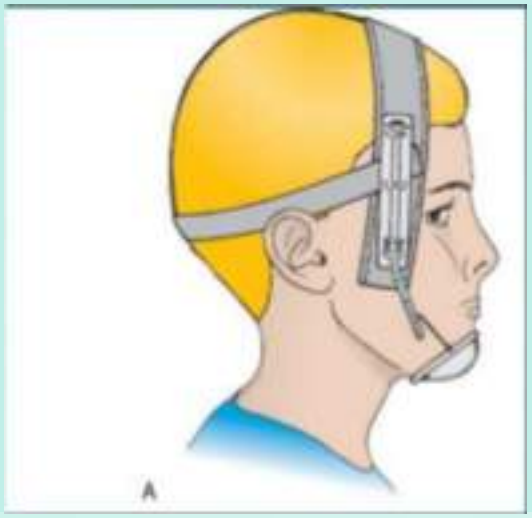
2. Myofunctional Therapy

- Skeletal anterior open bite can be treated during the growth period using functional appliances such as F.R IV or a modified appliance.





- This appliance incorporates bite blocks interposed between the posterior teeth that may have an intrusive action on the upper and lower posterior teeth.
- Posterior bite blocks are the functional appliances that are used to open the bite 3-4 mm beyond the rest position.



- Patients exhibiting a downward and backward rotation of the mandible with increased vertical growth, benefit from therapy using a vertical pull headgear with chin cup if treated during the mixed dentition period.
- Anterior open bite present along with a class II skeletal pattern benefit from a twin block appliance with high pull headgear to correct the anteroposterior discrepancy whilst controlling the vertical dimension.

3. Orthodontic Therapy

- Mild to moderate open bite can be managed using fixed mechanotherapy in conjunction with box elastics. This form of elastic application consists of an elastic that is stretched to extend between upper and lower anteriors. This brings about extrusion of the upper and lower anteriors.
- This may be combined with a transpalatal arch (TPA) and high pull headgear to limit vertical development of maxillary molar teeth. The TPA functions to prevent buccal rolling of the first molars, which can cause the bite to be propped open on their palatal cusps.

4. Role of extraction in anterior open bite

- When anterior open bite is associated with Proclined incisors, such as some bimaxillary proclination cases and class II malocclusions, retraction of incisors help reduce or eliminate the open bite.
- Extraction of premolars have been accepted by many clinicians in the management of skeletal open bite due to the drawbridge effect of reducing the inclination of both upper and lower incisors to increase overbite.
- Molar extraction have been advocated by a few clinicians to deepen the bite by forward mandibular rotation.

4. Role of Extra-Oral Traction

- High - pull headgear reduces the vertical eruption of upper molars, limits the vertical growth of the dento-alveolus and therefore minimizes the clockwise rotation and in some cases, results in counter clockwise rotation of the mandible.
- Headgear can be used in conjunction with fixed orthodontic appliance when they are inserted directly to the upper molar bands.
- Headgear can be used in conjunction with a functional appliance or an upper removable appliance such as maxillary intrusion splint.

- The vertical pull chin cup, together with fixed appliances, has been used to limit excessive vertical growth in growing patients. Chin cup therapy is effective in reducing the angle between the maxillary and mandibular planes by retardation n of eruption of posterior teeth and redirection of condylar growth.

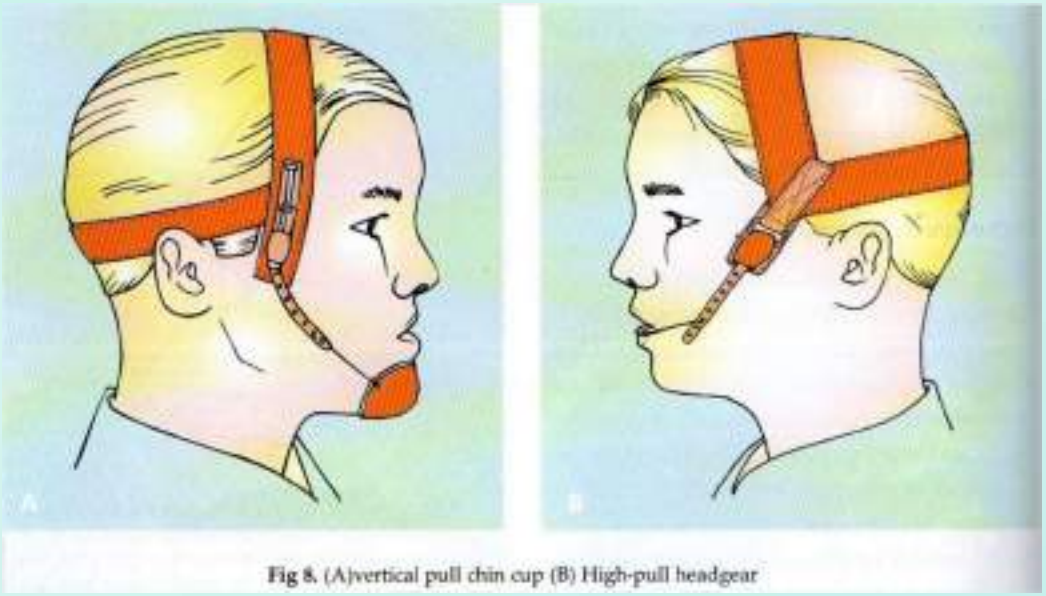


Fig 8. (A)vertical pull chin cup (B) High-pull headgear

5. Surgical Correction

- Skeletal open bites in adults are best treated by surgical procedures involving either maxilla or mandible.
- A combination of fixed appliance orthodontics and orthognathic surgery may be required to treat skeletal open bites.
- Surgery may be segmental or involve the whole jaw. Frequently bimaxillary surgery is required.
- Treatment shouldn't be commenced until growth has ceased.

Posterior Open Bite

- Posterior open bite is a condition characterized by lack of contact between the posteriors when the teeth are in centric occlusion.
- It mostly occurs in a segment of posterior teeth.

Causes of posterior open bite

1. Mechanical interference with eruption, either before or after the tooth emerges from the alveolar bone.
2. Failure of the eruptive mechanism of the tooth so that the expected amount of eruption does not occur.

Treatment

- Remove the cause.
- Lateral tongue spikes are a valuable aid in control of lateral tongue thrust.
- In case of posterior open bite due to infra occlusion of ankylosed teeth, it is best treated by crowns on posteriors to restore normal occlusal level.

Fig 9. Posterior open bite in a patient having a lateral tongue thrust.

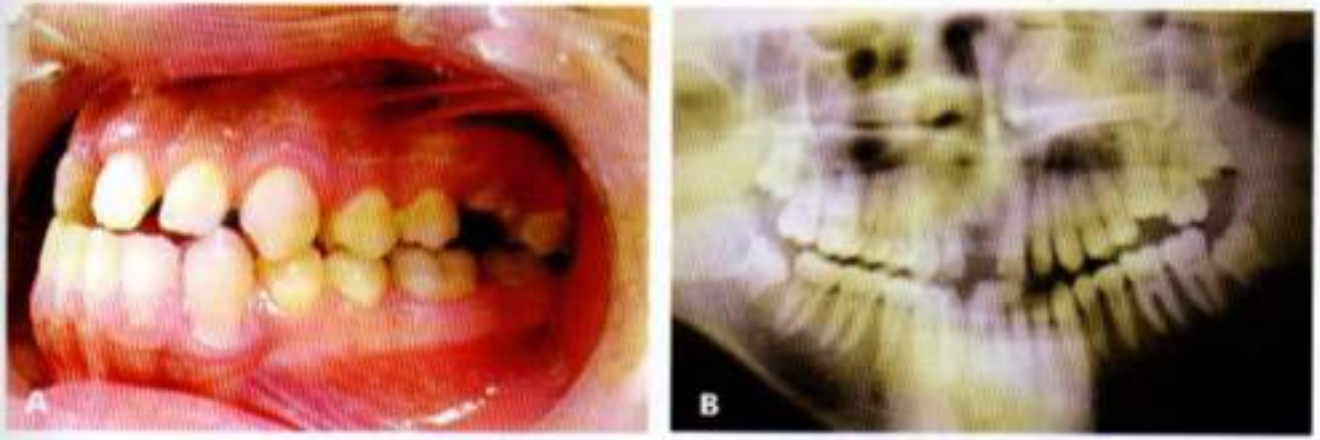


Fig 10. Posterior open bite in a patient having an ankylosed upper left first permanent molar

Deep Bite

- Graber defined deep bite as a condition of excessive over bite, where the vertical measurement between the maxillary and mandibular incisal margin is excessive when the mandible is brought into habitual or centric occlusion.
- The normal overbite is considered to be 2-4 mm.
- Deep over bite can be of two types

  Incomplete overbite

  Complete overbite

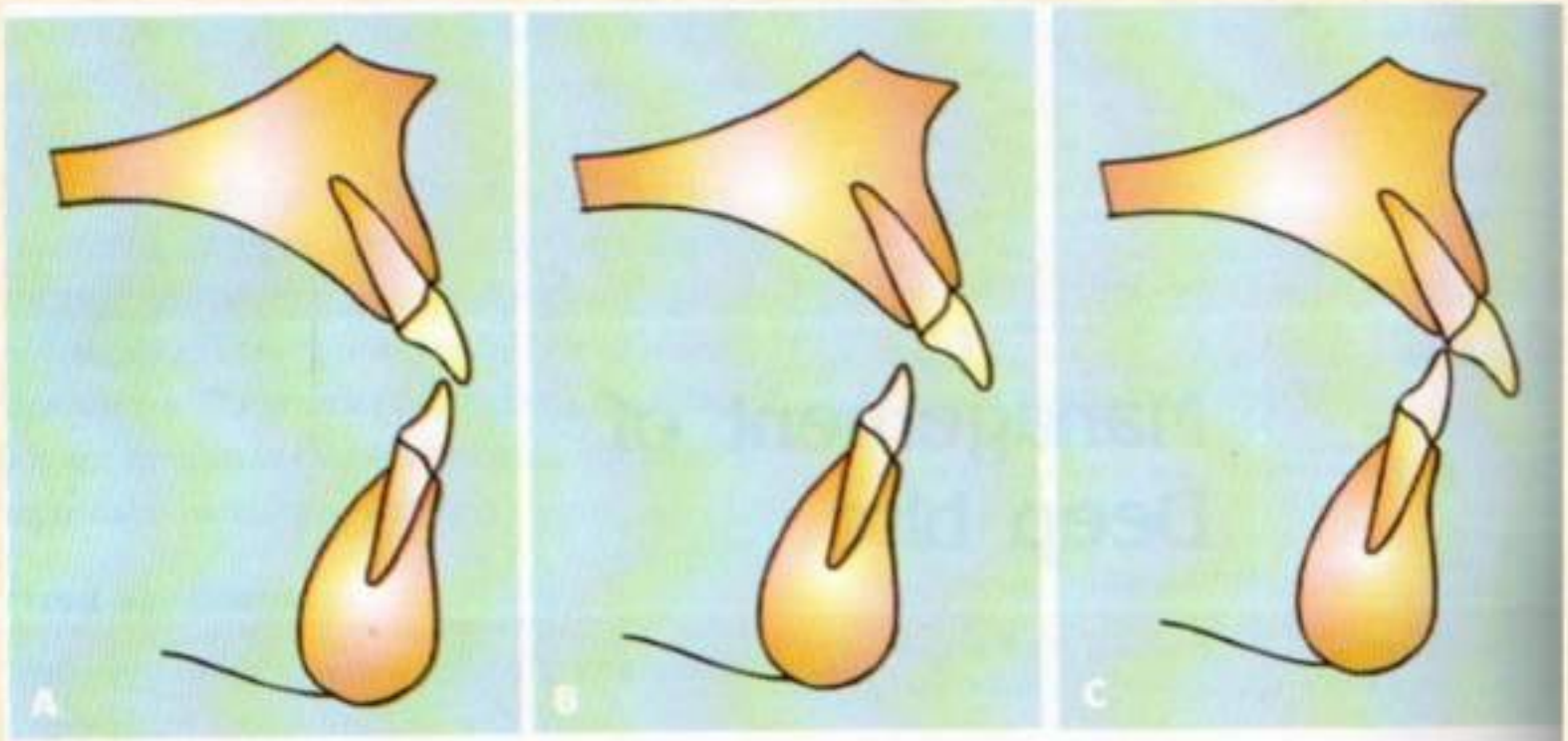


Fig 1. (A) Normal overbite (B) Incomplete overbite (C) Complete overbite

Two terms used in association with deep bite :-

- Cover Bite – It is a condition that is characterized by complete covering of mandibular anteriors by the maxillary incisors due to excessive overbite and retroclination of mandibular incisors as in Class TT div 2 malocclusion.

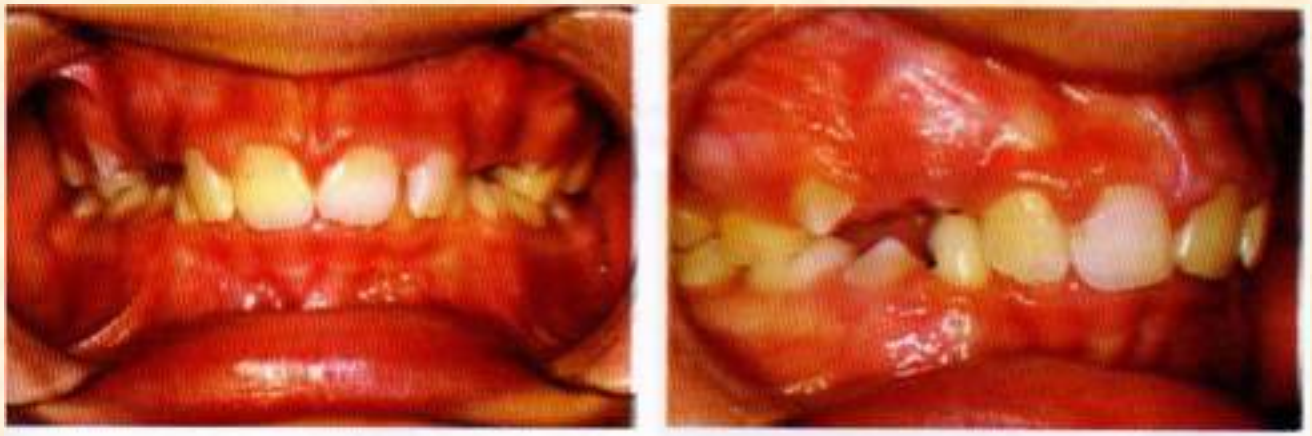


Fig 3. (A) & (B) Intraoral frontal and buccal views of a patient showing a cover bite. There is a deep overbite along with retroclination of the maxillary anteriors.

- Closed bite - It is a condition where there is excessive over bite as a result of loss on posterior teeth.

  Generally occurs in adults and rarely in children.

CLASSIFICATION

Deep bite can be broadly classified into :

1. Skeletal deep bite
2. Dental deep bite

1. Skeletal deep bite

- Usually of genetic origin.
- Caused by upward and forward rotation of the mandible.
- The deep bite can be further worsened by a downward and forward inclination of the maxilla.

Characterized by presence of following features –

- Patients exhibiting a horizontal growth pattern
- Anterior face height is reduced
- A reduced inter occlusal clearance
- A cephalometric examination reveals that most of the horizontal cephalometric planes such as mandibular plane, F.H plane, S.N. plane etc., are parallel to each other.

2. Dental deep bite

- It is characterized by the absence of any skeletal complicating features that are seen in skeletal deep bites.
- Dental deep bites occur due to over eruption of anteriors or infra occlusion of molars.

Characterized by the absence of any skeletal complication features that are seen in skeletal bites.

It occurs due to

- Deep bite due to over eruption of anteriors
- Deep bite due to infra occlusion of molars

Factors to be considered in treatment of deep bite

1. Lip Relationship

Fig 8. Lip considerations in the management of deep bite. (A) & (B) patient exhibiting normal upper lip with only 2 - 3 mm of maxillary incisal edge exposed, in such patients it is ideal to extrude the molars (C) & (D) Patient with deep bite who exhibits a short upper lip or a gummy smile. This should be treated by intrusion of the anteriors.

2. Growth Factor

Treatment of deep overbites in growing patients is considered easier to accomplish. Results of this are more stable in the presence of growth.

3. Consideration of vertical facial relationship

Extrusion of one or more posterior teeth usually results in downward and backward rotation of mandible. Thus an increase in facial height occurs. This can be a benefit in treating skeletal deep bites with excessive horizontal growth and upward rotation of mandible.

4. Consideration of inter occlusal space

The average inter occlusal space is 2-4 mm in the premolar region. Presence of an increased inter-occlusal space is an indication that the molars are not fully erupted. In such patients, deep bite can be treated by extrusion of posterior teeth.

The presence of a normal inter occlusal clearance is therefor an indication for intrusion of the incisors rather than extrusion of molars.

Treatment of Deep Bite

1. Removable Appliances

Anterior bite plane – It is a modified Hawley's appliance with a flat edge of acrylic behind the upper anteriors. When patient bites, the mandibular incisors contact the bite plane thus disoccluding the posteriors that are free to erupt.

Fig 10. (A),(B) & (C) Patient with deep anterior overbite treated using an anterior bite plane. (D) Note a clearance of 1.5 - 2mm exists between the upper and lower posterior teeth to enable extrusion of the posteriors.

2. Myofunctional Appliance

- Cases due to infra occlusion of molars can be treated by an activator designed and trimmed to allow the extrusion of these teeth.
- The inter occlusal acrylic is trimmed gradually to encourage the eruption of posterior teeth.

3. Fixed appliance therapy

- Use of anchorage bends:
- Anchorage bends are given in the arch wire mesial to molar tubes so that the anterior part of the arch wire lies gingival to the bracket slot.
- When these arch wires are pulled occlusally and engaged into the brackets, a gingivally directed intrusive force is exerted on the incisors, which reduce deep bite.

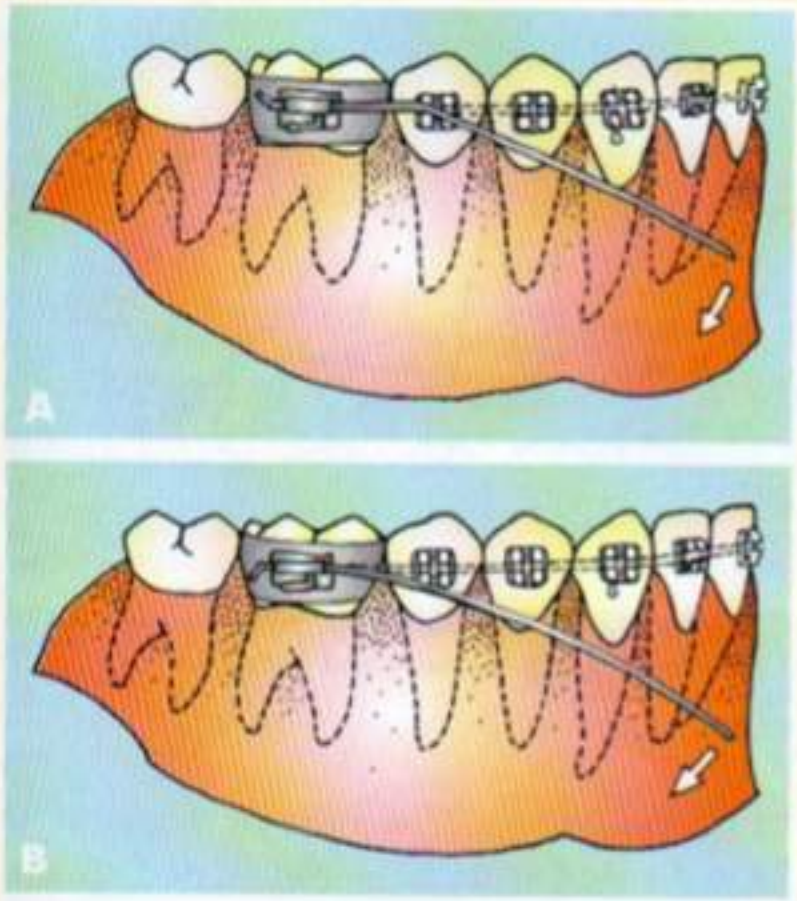


Fig 11. (A) Anchorage bend for intrusion of anterior teeth (B) Archwire with reverse curve of Spee

4. Use of Intrusion arches

Burstone described the use of intrusion arches in his segmental arch technique for the correction of deep over bites.

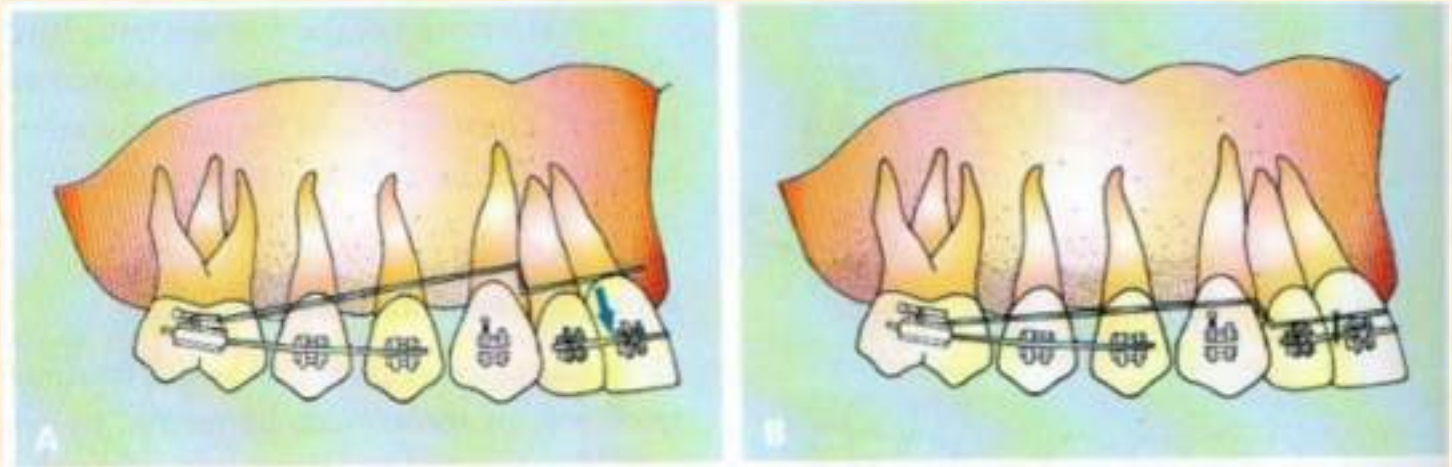


Fig 13. (A) Intrusion arch extending anteriorly from the auxillary tube of the molar resting passively at the depth of the vestibule. (B) The anterior segment is brought down incisally and is tied to the anterior segment arch wire.

5. Use of utility arches

- They are arch wires that are bent in such a way that they bypass the buccal segment and are engaged on the incisors.
- The main difference between the utility arches and the intrusion arches described earlier is that in case of utility arches the anterior segment is engaged into the slots of bracket while in case of the intrusion arch the anterior segment is tied to the segmental arch wire of anteriors.

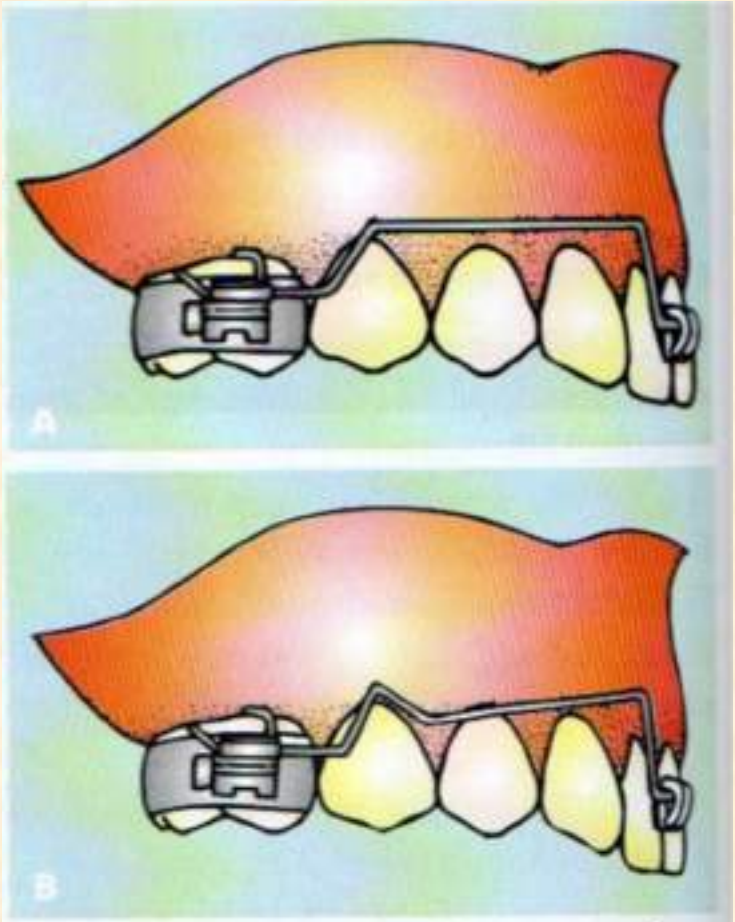


Fig 14. (A) Utility arch used for intrusion of anteriors (B) V bend given for activation of utility arch for anterior intrusion.

6. Use of fixed anterior bite plane

Fig 16. Fixed anterior bite plane

Fig 17. Bonded composite bite plane built on the lingual surfaces of the upper anterior teeth. The lingual surface of the teeth is etched and primer is applied and cured. The composite is applied to the lingual surface of the teeth and is spread and shaped using micro brushes. This forms a bite plane 2-3 mm from the incisal edge. The composite can be selectively grinded using burs to have a balanced contact with the lower incisors.

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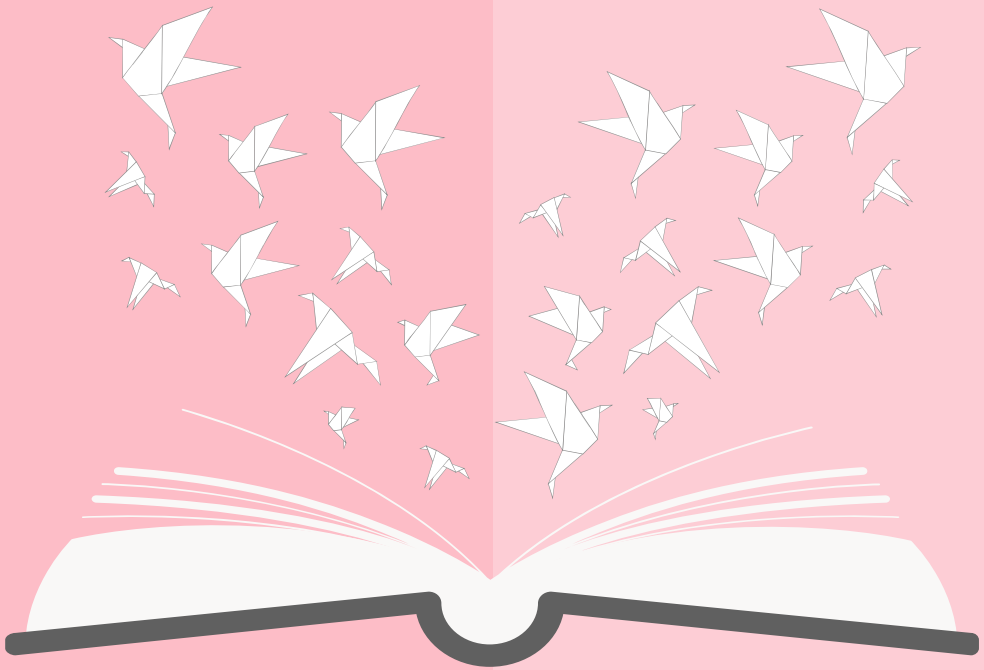

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