

THE PROBLEM CALLED DEEP BITE AND ITS MANAGEMENT - A REVIEW.

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Article Info: Received 30 November 2019; Accepted 21 December 2019

DOI: <https://doi.org/10.32553/ijmbs.v3i12.811>

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Conflict of interest: No conflict of interest.

Abstract

Deep bite is one of the most common and most deleterious malocclusion seen in children as well as adults that can occur along with other associated malocclusions. An unfavorable sequelae of this malocclusion predisposes a patient to periodontal involvement. Abnormal function, improper mastication, excessive stresses, trauma, functional problems, bruxism, clenching and temporomandibular joint disturbance.

Introduction

Grabner^{1,2} has defined deep bite as a condition of excessive overbite, where the vertical measurement between the maxillary and mandibular incisor margins is excessive when the mandible is brought into habitual or centric occlusion while Proffit³ defined overbite as vertical overlap of the incisor teeth when the posterior teeth are in contact.

CLASSIFICATION:

Deep bite can be classified as

- a) Dentoalveolar / Skeletal by Rakosi b) True/Pseudo by Hotz and Muhlemann
- b) Incomplete/ Complete by Grabner.

ETIOLOGY:

I. INHERENT FACTORS

1) Tooth morphology⁴

Anterior teeth with long crowns will appear to have a greater overbite than with short crowns, even though the contact relationship of the incisors in both cases may be the same.

Therefore, any measurement of the degree of overbite should be derived not only from the amount of incisor overlap but also from the point on the palatal surface at which the opposing tooth strikes.

2) Skeletal pattern and malocclusion⁴

An excessive overbite may be a manifestation of a malocclusion in several ways.

1. Supraeruption of maxillary or mandibular or both anterior segments.
2. Infraocclusion of the maxillary or the mandibular posterior teeth or both.
3. Lack of downward and forward growth of the mandible during the transitional period from the deciduous to the permanent dentition.
4. Retardation of ramus growth, with continuous eruption of the anterior teeth.
5. Insufficient length of masticatory muscles, causing inadequate eruption of posterior teeth.
6. Severe disharmony of the dental arches.
7. Lack of dentoalveolar growth during the eruption of bicuspid and permanent posterior teeth as a result of crowding of dental arches.

3) Condylar growth pattern

Patients with deep bite have an upward and forward growth of the condyle with reduced anterior face height. Growth in this direction often results in more horizontal displacement of the mandible and is most effective in improving the position of chin, often desirable in patients with class II division I malocclusion.

Whether or not a deep bite develops depends on the relationship between maxillary and mandibular incisors. If the mandibular incisors have proper contacts with the lingual surfaces of the maxillary incisors, chances are best that a deep bite will not develop.⁵

II. ACQUIRED FACTORS⁴

1) Muscular habits

Severe clenching or grinding habits or hypertonicity of the masticatory muscles may cause depression of the posterior teeth. Excessive tooth wear also may result in a loss of vertical height.

2) Changes in tooth position

Premature loss of deciduous molar teeth may permit mesial drifting of the first permanent molars with subsequent impactions or crowding of bicuspid teeth. This anterior displacement of the posterior support of the dentition may lead to the development of an excessive overbite.

3) The loss of posterior supporting teeth

In the adult dentition, extraction of molar or bicuspid teeth without replacement will permit adjacent teeth to drift toward the space. Such migration often causes abnormal axial inclinations and a deepening of the bite or commonly called as collapsed bites. This frequently directs excessive trauma against maxillary incisor teeth, and anterior displacement may result.

4) Lateral tongue thrust habit.

A lateral tongue thrust or postural position frequently can produce an acquired deep overbite. This type of dysfunction produces an infraocclusion of posterior teeth, which in turn leads to a deep bite. In these cases the free way space is usually large, which is favorable for functional appliance treatment.

DIAGNOSIS:

1. CLINICAL & PHOTOGRAPHIC EXAMINATION⁶

A) Extraoral examination (in natural head position):

- Patient has a short, square face.
- The upper lip curves downward and the corners of mouth are below the occlusal line.
- In centric occlusion, distinct skin folds are seen lateral to the oral commissure.
- Broad alar bases and large nostrils.
- The posterior part of face appears wide because of prominent mandibular angles.
- The nasolabial angle is normal or obtuse.
- With the mandible in a rest position and the upper lip relaxed, the incisal edges of the maxillary anterior teeth are positioned above the inferior margin of upper lip.
- There is distinct chin button, which is made more apparent by a deep mentolabial fold.

B) Intraoral examination

- **Absolute transverse maxillary excess.**
- The maxillary arch is broad with flat palatal vault.

- Maxillary buccal crossbites are commonly associated with interdental spacing.
- Gingival recession with maxillary and / or mandibular incisors is seen.

Dentoalveolar deep bite shows following features.

- Majorly created by premature loss of permanent teeth causing a lingual collapse of maxillary or mandibular anterior teeth.
- Similarly loss and / or mesial tipping of the posterior teeth may also cause a deepening of the overbite.
- Occasionally a deep bite may be caused or accentuated by an aberration in the tooth morphology. This can be diagnosed by careful analysis of size and shape of teeth.

Skeletal deep bite shows.

- Malrelationship of alveolar bones and / or underlying mandibular or maxillary bones.
- In the mandibular dentition it may manifest as a deep curve of spee or reverse curve of spee in the maxillary dentition.

2. STUDY MODELS

- Study models show excessive overbite.
- Lower arch shows exaggerated curve of spee.
- Typically reverse curve or compensatory curve of maxillary occlusal plane in cases of class II division 2 malocclusion.
- Palatal vault appears to be flat.
- Molars are in infraocclusion in true deep bite cases.
- Incisors are supraerupted in pseudo deep bite cases.
- Maxillary arch is wider.
- Sometimes teeth are in buccal cross bite.

3. CEPHALOGRAMS

Cephalometrically skeletal deep bite and dentoalveolar deep bite can be differentiated from each other as the dentoalveolar deep bite shows only changes in dentition and the maxillary and mandibular bases are normal.

Few parameters in the different cephalometric analysis emphasize and differentiate the vertical dysplasia.

They are -

1) DOWNS⁷ ANALYSIS (1948)

In skeletal deep bite cases, the mandibular plane angle and y-axis value decreases where as interincisal angle increases.

2) STEINER⁷ ANALYSIS (1953)

In skeletal deep bite cases, mandibular plane angle decreases and interincisal angle increases.

3) RICKETTS⁷ ANALYSIS (1957)

In skeletal deep bite cases facial axis increases and mandibular plane angle decreases.

4) SCHWARTZ⁷ ANALYSIS. (1958).

Base plane angle and gonial angle decreases in skeletal deep bite cases. Base plane angle decreases due to the anticlockwise rotation of mandible and or clockwise rotation of palatal plane anteriorly. In the skeletal deep bite it is 23⁰ at 9 yrs of age and 20.5⁰ at 15 yrs of age.

Interincisal angle increases in deep bite cases.

5) SASSOUNI^{8,9,10} (1969)

Sassouni developed an analysis for differentiating deep bite and / or open bite relationship. According to him, the constitution of each skeletal type may be due to a positional or dimensional imbalance.

When it is positional, the direction of the displacement is described as anterior or posterior, downward or forward, upward and lateral. When it is dimensional, it is described as large or small.

TREATMENT CONSIDERATIONS:**1) SOFT TISSUE CONSIDERATION¹¹****a) INTERLABIAL GAP**

Any extrusive mechanics in the molar area to correct deep overbite swings the mandible downward and backward, thereby increasing the interlabial gap. This corrects the dental problem but results in an undesirable soft tissue changes.

If the patient does not have any interlabial gap with deep overbite, extrusion of posterior teeth may be a treatment of choice, provided that other treatment planning considerations allow it.

b) INCISION - STOMION DISTANCE¹¹

A 3 to 4 mm incision - stomion distance is esthetically pleasing. Any attempt to correct deep overbite with extrusion of molars increases this distance with concomitant increase in the interlabial gap.

c) SMILE LINE¹¹

During an esthetically pleasing smile, the upper lip line should be at or near the gingivoenamel junction. Often patients have a smile that shows an abundance of gingival tissue. The objective in these patients should be to prevent extrusion of posterior teeth at any cost. Otherwise, the esthetic result is poor.

d) LIP LENGTH¹¹

Often a patient has a large interlabial gap or a large incision stomion distance because of a short upper lip. The treatment option of choice in these patients is to correct deep overbite by intrusion of upper incisors. This option prevents extrusion of posterior teeth and helps in improving upper incisor -upper lip relationship.

e) LIP TONICITY¹¹

In patients who exhibit hyperactive and tense upper and lower lips, flaring of upper and lower incisors results in relapse, owing to muscle pressure.

2) SKELETAL CONSIDERATION¹¹

A careful assessment of the ratio of upper to lower face height of 45%: 55% is optimal. In patients with large lower facial height, an extrusion of molars to correct deep overbite is not the treatment of choice because it further lengthens the face with concomitant undesirable changes of the soft tissues. Similarly, patients with short vertical dimension often have a class II division 2 malocclusion along with a deep overbite. In these patients, extrusion of posterior teeth may be the treatment of choice to open the bite.

3) FUNCTIONAL CONSIDERATION¹¹

Extrusion of posterior teeth drops the mandible downward and backward, and the condyle assumes a new position in the temporomandibular joint articulation. This can result in two adjustments so that equilibrium between function, muscles and TMJ anatomy can take place following the orthodontic treatment. First, if the extrusion of the posterior teeth remains stable, the condyle, TMJ and muscles have to remodel or readapt to their new morphologic position of the mandible. Second, the adjustment results in relapse because the muscles of mastication and altered occlusion may pound the extruded posterior teeth back to their original position until a soft tissue and hard tissue equilibrium is attained again.

4) DENTAL CONSIDERATION¹¹

Intrusion of incisors is an ideal option to correct deep bite because it maintains the vertical dimension of the patient. If a patient needs intrusion of incisors to correct deep overbite, up to 4.0 mm upper incisor intrusion can be accomplished without any significant root resorption. If a patient needs more than 4.0 mm, of upper incisor intrusion, it can be combined with the intrusion of lower incisors.

Intrusion should also be the treatment of choice for adult patients who have had significant bone loss

around the incisors. Periodontal disease should be under control in adult patients before the start of orthodontic treatment.

5) STABILITY¹¹

Stability of attained results should be prime concern in correction of deep bite. In children, often the growth acts as a major catalyst in taking care of extrusive side effects. In adults, adaptation of the muscles, vertical dimension, and TMJ is difficult. The treatment option in adults should be limited to teeth whenever possible. Intrusion of teeth can be accomplished without any change in skeletal and muscular components of the face.

6) OCCLUSAL PLANE¹¹

This objective, if not considered along with lip and vertical facial height considerations may result in unpleasant and unstable conditions in deep bite cases.

7) INTEROCCLUSAL SPACE¹¹

The correction of a deep overbite by extruding posterior teeth to encroach on this space should be avoided as it often results in relapse caused by the muscles of mastication and because of full occlusal contact of posterior teeth during speech and mastication. It is also believed that this may also result in pathologic changes at the temporomandibular joint.

8) TREATMENT TIME AND AGE OF PATIENT¹¹

In adult patients showing excessive deep bite with accompanying high smile line, decreased vertical facial height and alveolar problems, the length of treatment may be very long. In these instances, the patient should be given a choice for an orthognathic correction of problem. In these patients, the treatment plan to correct the excessive overbite should be done in conjunction with oral and maxillofacial surgeons.

OPTIMAL INTRUSIVE FORCE FOR ANTERIOR INTRUSION

Burstone¹² in 1977, suggested 50 gram of intrusive force for upper central incisors, 100 gram force for centrals and laterals and 200 gram for six upper anteriors. He advocated use of 40 gram for four lower incisors and 60 gram for all six lower anterior intrusion. **Bench, Gugino and Hilgers¹³ in 1978**, advocated the intrusive force of 15 to 20 gram per lower incisor or 60 to 80 gram for all four lower incisors. **Ricketts in 1980** advocated the use of 125 gram to 160 gram of force for upper incisor intrusion and 60 to 75 gram for lower incisors. **Liu and**

Herschleb in 1981 suggested use of 80-100 gram of force for four incisor intrusion. **Nicolai¹⁴ in 1985** advocated that intrusive force should be 60 gram/cm² of occlusoapical projection of root surface area. **Kesling^{15,16} in 1985** suggested 14 gram of net force for six upper anterior intrusion 35 gram for lower six anteriors. **Proffit³ in 1993** suggested 15 gram of force needed for incisor intrusion. **Siatkowski in 1997**, based on the work of Dermaut suggested 10-15 gram for upper central incisor where as 5-10 gram for upper lateral and 15-25 gram for upper canines. **Karant and Shetty¹⁷ in 2001** advocated 60 gram of force for four upper incisors and 100 gram of force for six anteriors; where as 40 gram of force for lower four incisors and 80 gram for six lower incisors.

Thus the force ranges on an average from 15 - 20 gm for each upper incisor and 10 - 15 gm for each lower incisor.

But in adults the forces are to be applied carefully and somewhat towards a lower range.

TREATMENT MODALITIES:

A. CORRECTION OF DEEP BITE WITH REMOVABLE APPLIANCES

1) Bite plane or bite plate

Used in 1879 by **Miller⁴**, it permits the elongation of posterior teeth which depends on the growth of alveolar bone. This new bone must be conditioned to withstand the stresses of mastication by withdrawal of bite plate gradually.

2) Sved Bite Plane

Sved^{4,18} modified the bite plate to attempt to obtain some depression of the maxillary anterior teeth as well as the mandibular anterior teeth. He has covered acrylic on the entire palatal and incisal surfaces and extended up one third of the labial surfaces of the anterior teeth

3) Posterior tongue crib¹⁹

Lateral tongue thrust or lateral positioning of the tongue during function causes deep bite due to infraocclusion of molars. This true deep bite is called as functional deep bite as the tongue is positioned on the occlusal surfaces during function.

4) An Essix intrusion appliance²⁰

An Essix appliance does not require clasps; it is easily constructed, and can be thermoformed from a single 1mm sheet of Essix plastic.

B. CORRECTION OF DEEP OVERBITE WITH MYOFUNCTIONAL APPLIANCES

Treatment in the mixed dentition period requires the elimination of environmental factors that are inhibiting eruption of the posterior teeth.²¹

1) THE ACTIVATOR²¹

Deep overbite cases with infraocclusion of molars can be treated by activators designed and trimmed to permit extrusion of these teeth with either moderate or high construction bite depending on the freeway space.

In deep overbite cases caused by supraocclusion of the incisors, the interocclusal space is usually small so the activator should not be constructed with a high construction bite.

Trimming of activator in deep bite cases^{21,22}

Selective trimming of the activator can be done to intrude or extrude the teeth.

In deep bite cases, intrusion of the incisors is achieved by loading the incisal edge of these teeth with acrylic. Extrusion of molars is achieved by loading the palatal surface above the area of greatest convexity in maxillary and below the area of greatest convexity in mandible.

2) THE BIONATOR^{21,22}

Cases of a deep overbite can be successfully managed with the standard type of Bionator, after grinding away of the acrylic in a manner that permits step by step uninhibited eruption of the buccal segment teeth.

3) FUNCTIONAL REGULATOR^{21,22}

For correction of deep overbite FR Ia and FR Ib appliances are used. Increase of vertical extraoral space is possible because the construction bite is taken so that the bite is opened in the posterior segments as the mandible is held forward. The eruption or elongation of the posterior teeth takes place in manner similar to that seen with anterior biteplates, except that the buccal soft tissue into the interocclusal space.

4) THE TWIN BLOCK FUNCTIONAL APPLIANCE²³

Deep overbite by twin block is reduced by vertical over correction to an edge-to-edge incisor relationship with an interincisal clearance of 2-3 mm in the protrusive bites. Occlusal cover of the posterior molars of 1 mm is equivalent to 3 mm to 4 mm vertical clearance in the first premolar region.

Overbite reduction is achieved by trimming the occlusal cover on the upper twin block occluso-

distally to encourage eruption of lower molars. It is essential that this be done as early as possible in treatment, usually when fitting twin blocks, to allow vertical development to proceed concurrently with sagittal correction because vertical development is slower than sagittal correction which is normally achieved within 6-9 months.

CORRECTION OF DEEP OVERBITE BY HEADGEAR²¹

The cervical pull headgear is indicated in deep bite cases. It exerts a vertically downward component of force with the potential for extrusion of the molars. So with the cervical pull headgear the molars get distalized and extruded by applying 200-300 gm of force per side. The force duration should be 14 to 16 hours per day or more.

C. CORRECTION OF DEEP BITE WITH FIXED APPLIANCE THERAPY

C.1) CORRECTION OF DEEP BITE WITH FIXED BITE PLANES

I) MODIFIED NANCE APPLIANCE²⁴

The size of anterior buttons can be varied to create an inclined plane that will bring condyle forward into a harmonious relationship. Once a true centric relation has been reached, the occlusion can easily be adjusted as necessary.

II) BONDED BITE PLANES WITH COMPOSITE RESIN (INDIRECT TECHNIQUE)²⁵

Bonded bite planes allows:

- Mandibular brackets placement at the same appointment as the bite planes.
- Unimpeded movement of posterior teeth caused by occlusal interferences.
- Mandibular brackets are almost never sheared away.

III) BONDED ACRYLIC LINGUAL BITE PLANES (DIRECT TECHNIQUE)²⁶

This produces an intrusive effect or growth restraint on the incisors while allowing the extrusion of the posterior teeth. It is also called as lingual bite steps or bite turbos.

IV) A FIXED LABIAL AND LINGUAL TECHNIQUE FOR RAPID BITE OPENING²⁷

The bite plane which is a feature of lingual bracket, eliminates the need for patient co-operation. Bite opening is hastened by the simultaneous bonding of the upper and lower arch, and the lingual brackets can be removed soon after bite is opened.

V) TEMPORARY BITE RAISER

Given by Guray²⁸ is made of 0.036" stainless steel wire. A double molar tube is welded on the buccal

side of molar band along with a lingual button which is welded. Accessory slot is used to prepare a bite raiser. One end of 0.036" Stainless steel wire is inserted 3-4 mm into the tube from the mesial side and the other end of the wire is inserted from the distal side. The section of wire between the two ends is adapted to the occlusal morphology of the tooth. A bend in the lingual portion of the wire is ligated to a welded lingual button on the maxillary tooth. The ligature wire can be cut to allow the occlusion to be checked without removing the entire auxiliary. The ends of the bite raiser hinge on the molar tube. Recently however, **Richard Ceen**²⁹ has introduced a prefabricated version of temporary bite raiser.

The bite raiser has several advantages over existing techniques.

- It can be placed or removed easily and quickly with minimum patient discomfort.
- The patient's bite relationship can be assessed by hinging the device out of occlusion.
- No laboratory procedures are required.
- Increased patient acceptance.
- The stainless steel appliance is adjustable and designed for use with either occlusally or gingivally placed headgear tubes.

C.2) CORRECTION OF DEEP BITE WITH BEGG'S TECHNIQUE^{15,16}

Deep overbites are eliminated and overcorrected in the first stage of Begg's technique.

I) Arch wires^{15,16}

According to **Kesling** 0.016" arch wires are better for opening the bite by elevating the mesial marginal ridges of anchor molars which tends to relapse after active treatment.

Mollenhauer suggests the use of 0.018" premium plus wire for upper anterior intrusion. This wire can generate 75gm of force with an anchor bend of approximately 50 degrees. However, the 0.18" arch wire producing such high magnitude of intrusive force can also severely tip the anchor molars distally especially so, if there are no teeth present distal to the anchor molars.

II) Bite opening bends^{15,16}

Many authors have proposed different sites for bite opening bends in the arch wires.

a) Anchor bend or conventional bite opening bends

Earlier these bends were called as tip back bends. **Dr. Kesling** has appropriately named them as anchor

bends. These bends placed 3 mm mesial to the molar tube, tend to cause more intrusion of the upper canines and progressively less intrusion of the lateral and central incisors due to bowing of the arch wire in canine area.

b) Gable bend

Gable bends placed distal to the canines, normally made in the third stage archwire to maintain bite opening attained in the earlier stages. It tends to cause relative extrusion of canines, while there is progressively more intrusion of the lateral and central incisors. This has a more intrusive effect on central and lateral incisors.

c) Hocevar's modification

In the Hocevar's modification a bend on either side of the canines are given. With this modification, the central incisors are subjected to intrusion while the canine and lateral incisors are extruded (canine more than lateral incisor) with respect to the central incisors.

d) Kameda's modification¹⁶

Using a simultaneous anchor and gable bends, the canines and the premolars if engaged are extruded, while the lateral and centrals experience progressively more intrusive effect. Thus the bite opening takes place by extrusion of posteriors and intrusion of anteriors.

e) Dr. Jayade's modification¹⁶

A mild gingival curve is incorporated in the anterior section, starting from mesial one cuspid circle to the corresponding point on the other side. This should lift the archwire at the midpoint by about 3mm over the brackets.

He further augmented the intrusive action of the gingival curve by incorporating a vertical step-up bend 4-5mm in height and placed 2 to 3mm mesial to the molar tube on both sides. Anchor (tip-back) bend of the required degree is placed at the upper end of the step. This results in uniform intrusion of all the six upper anterior teeth.

III) Class II elastics

The Class II intermaxillary elastics are applied at the start of treatment. In the first stage of treatment these intermaxillary Class II elastics, by their force, tip back the crowns of the six upper anteriors.

A net intrusive force of 60gm can be obtained by a combination of 75gm archwire generated intrusive force and appropriate modifications of Class II elastics as follow: -

a) By using light elastic force for longer periods (from 2 to 5 days). Elastics if not changed for 5 days exert a very light Class II force, most of the time, since the elastic force diminishes rapidly in the oral environment. Such low force values do not adversely affect concomitant retraction, because forces as light as 5gm are known to be capable of achieving tipping movements in the Begg technique.

b) **Sims** has suggested the use of 3/8" ultra light elastics instead of routinely used 5/16" light elastics. He suggested continuing the same elastics for 4-5 days, till they break.

C.3) CORRECTION OF DEEP BITE WITH EDGEWISE TECHNIQUE³⁰

I) Intrusion of individual teeth

For intrusion of a tooth, the segment of arch wire is made to lie gingivally to the bracket groove. When forced into place it exerts an intrusive force on the tooth.

II) Mass movements

Using remaining teeth in the arch as anchors, it is possible to depress the incisors or bicuspid as a unit, but it will require the entire arch to depress one canine or one molar. The reaction to depress teeth with the archwire is often dissipated by the occlusion, which can prevent the eruption of anchor teeth. This type of bend is commonly referred as a step bend. Thus, a step bend that will raise or lower a contact point relation is a bend that changes the level of the archwire.

Supra erupted anterior teeth may also be depressed by ligation to a straight arch wire that lies gingivally to their brackets.

C.4) CORRECTION OF DEEP BITE WITH PREADJUSTED EDGEWISE TECHNIQUE (STRAIGHT WIRE APPLIANCE)

Deep overbites can be effectively controlled with preadjusted appliances when the following principles are observed.

- 1) Avoid extractions in low angle cases whenever possible.
- 2) Use 0.022" slots with 0.019" x 0.25" working archwires and 0.018" slots with 0.017" x 0.25" working archwires.
- 3) Use anterior bite plates at the beginning of treatment in moderate to low angle cases.
- 4) Use light initial forces to avoid deepening the bite.
- 5) Avoid elastic retraction of cuspid brackets.

6) Band or bracket second molars as early as possible.

7) Use Class II elastics selectively.

8) Do not hurry final leveling of the archwires, use flat rectangular archwires at first, and then bite opening curves as needed.

9) Use gentle forces for space closure in extraction cases.

C.5) CORRECTION OF DEEP BITE WITH SEGMENTED ARCH TECHNIQUE¹²

There are six major principles governing deep overbite correction by intrusion with a segmented arch technique.

1) Use of optimal magnitude of force and the delivery of this force constantly with low-load deflection rate springs.

2) Use of point contact in the anterior region.

3) Position of the force – careful selection of the point of force application with respect to the center of resistance of all the teeth to be intruded.

4) Selective intrusion based on anterior tooth geometry.

5) Control over the reactive units by formation of a posterior anchorage unit.

6) Inhibition of eruption of posterior teeth and avoidance of undesirable eruptive mechanics.

The basic mechanism for intrusion consists of three parts.

1) A posterior anchorage unit,

2) An anterior segment and

3) An intrusive arch spring.

A) THREE-PIECE INTRUSION ARCH^{31,32}

A three-piece base arch is used to intrude the anterior segment. A heavy stainless steel segment (0.018" x 0.025") with distal extensions below the center of resistance of anterior teeth is placed passively in the anterior brackets. The distal extensions end 2 to 3 mm distal to the center of resistance of the anterior segment.

The intrusive force is applied with a 0.017" x 0.025" TMA tip-back springs. The overall force system obtained is an intrusive force anterior and an extrusive force posterior associated with the tip back moment. The design of this appliance enables low-friction sliding to occur along the distal extension of the anterior segment during space closure.

The application of light, distal force delivered by a class I elastic to the anterior segment is used to alter the direction of the intrusive force on the anterior

segment. This appliance design allows the application of the intrusive force to get true intrusion of the incisors along their long axis.

B) CORRECTION OF DEEP BITE WITH UTILITY ARCHES

Late in the 1950's Robert Ricketts¹³ gave the utility arch mechanics for the intrusion of lower incisors which has shown clinically that the four lower incisors can be intruded very efficiently with forces of 15 to 20 gram per lower incisor or 60 to 80 gram for all four lower incisor teeth. The upper incisors have a root surface cross section that is almost twice as large as the lower incisors and, therefore the force required for their intrusions is twice as much as the lower arch, approximately 160 gram or 40 gram per each tooth.

The mandibular utility arch is best fabricated from 0.016 x 0.016 Blue Elgiloy wire to deliver a continuous force to the lower incisors. The design of the mandibular utility arch is dictated by the requirement that this light force be delivered in a continuous manner of a long lever arm from the molar to the incisors.

The maxillary utility arch takes approximately double the force to intrude the upper incisors, compared to the lower incisors, approximately 125 – 160 grams. This is one of the reasons for using the 0.016 x 0.022" blue Elgiloy or Nitinol maxillary utility arch in the initial phase of treatment. The second reason is that the span between the upper molars and the incisors is a greater distance and, therefore, decreases the force delivered to the maxillary incisors.

The use of the 0.016 x 0.022" utility arch in order to create the added force needed to intrude the maxillary incisors has an adverse tipping effect on the maxillary molars. It therefore, becomes necessary to stabilize the molars. The use of Quad-Helix, lingual arch, or transpalatal arch will help in stabilizing the maxillary molars.

C) MULLIGAN'S INTRUSION ARCH

Mulligan's³³ intrusion arch is used for incisor intrusion and molar extrusion in deep bite cases. The archwire used is round 0.016" stainless steel. The bracket slot is 0.022 x 0.025". All brackets are leveled and uprighted with initial wires. Then the 0.016" round stainless steel wire is placed in the setup. Arch wire is tightly cinched back distal to the molars. The tipback bends or 'V' bend given to the arch wire for intrusive action on incisors and extrusive action on molars.

The tip back produces light intrusive forces on the incisors. In cases of growing patients the intrusive force should be light to hold the incisors at their positions. In adult patients with deep bite, heavier intrusive force is used for intrusion of the anteriors.

C.6) KALRA SIMULTANEOUS INTRUSION AND RETRACTION

The K-SIR (Kalra simultaneous Intrusion and Retraction) archwire given by Varun Kalra³⁴ is a modification of the segmented loop mechanics of Burstone. It is a continuous 0.019" x 0.025" TMA archwire with closed 7mm x 2mm U – loops at the extraction sites.

To obtain bodily movement and prevent tipping of the teeth into the extraction spaces, a 90° V- bend is placed in the archwire at the level of each U – loop. This V – bend, when centered between the first molar and canine during space closure, creates two equal and opposite moments to counter the moments caused by the activation forces of the closing loops.

A 60° V- bend located posterior to the center of the interbracket distance produces an increased clockwise moment on the first molar, which augments molar anchorage as well as the intrusion of the anterior teeth.

To prevent the buccal segments from rolling mesiolingually due to force produced by the loop activation, a 20° antirotation bend is placed in the archwire just distal to each U – loop.

C.7) THE CONNECTICUT INTRUSION ARCH

The Connecticut intrusion arch (CTA) given by Ravindra Nanda³⁵ is fabricated from a nickel titanium alloy to provide the advantages of shape memory, spring back and light continuous force distribution (Image 17). It incorporates the characteristics of the utility arch as well as those of the conventional intrusion arch. The CTA is preformed with the appropriate bends necessary for easy insertion and use.

Two wire sizes are available: 0.016" x 0.022" and 0.017" x 0.025". The maxillary and mandibular versions have anterior dimensions of 34 mm and 25 mm, respectively

C.8) BITE OPENING AND SPACE CLOSING ARCHWIRE

This arch wire is given by Leonard Bernstein.³⁶ The purpose of this archwire is to provide an upward and backward force in an arc-shaped motion to the maxillary central and lateral incisors with retraction force at the same time. By keeping a distal closing force on these teeth, the upward and backward force producing bite opening seems to be enhanced.

0.018" x slot bracket with wires of 0.016, 0.018 and 0.016 x 0.022 gauge are most commonly used.

C.9) EQUIPLAN – QUAD HELIX COMBINATION

Dr. J. M. S. Pato³⁷ developed the appliance in 1992 by attaching a planas equiplan to a quad helix or a transpalatal bar. The palatal expander is inserted into the lingual tubes of the first molar bands or welded directly to the molar bands. The planas equiplan is attached to the anterior arms with acrylic or directly to the anterior helices of the Quad helix.

It can be used successfully in patients of any age with dental deep bite, in growing patients with skeletal deep bite. Its main advantage is that the fixed Quad Helix expands the palate at the same time that the occlusal plane is unlocked to allow uninterrupted orthodontic movements.

C.10) A LINGUAL ARCH FOR INTRUDING AND UPRIGHTING LOWER INCISORS³⁸

A simple lingual arch with elastomeric chain attached to lingual buttons on the incisors overcomes the problems of both sectional and full arches by creating equal downward force vectors that pass behind the centers of resistance of all four incisors.

Four elastic chains are attached to the anterior bridge of the lingual arch with the mosquito forceps. If intrusion is primary goal and the teeth are already fairly upright, the elastic chains should come off the lingual arch on the labial side.

C.11) CORRECTION OF DEEP BITE WITH MINI SCREW ANCHORAGE SYSTEM³⁹

To intrude the upper incisors, the best placement of mini-screw is between the upper lateral incisors and the canines. The placement of the mini-screws should be done after leveling and alignment, in order to maximize the interradicular space at the placement site. In order to avoid tipping the upper incisors buccally during the intrusion, the end of the arch wire is cinched back.

C.12) CORRECTION OF DEEP BITE WITH MAGNETS⁴⁰

Samarium cobalt magnets of attracting type extrude posterior segments with average 120 grams of force.

C.13) CORRECTION OF DEEP BITE WITH ORTHODONTICS AND SURGERY⁴¹

In patients with very short face height, upward and forward rotation of the chin may partially or even totally conceal their mandibular deficiency. These patients may need to have their chin moved straight down even so, advancement of mandible is needed otherwise, the chin would inevitably go backward as is moved downward because the mandible would rotate on an arc.

It is much more difficult to permanently increase anterior face height by rotating the mandible at the condyles than it is to rotate it within the body-ramus region via a ramus osteotomy. The first approach requires lengthening of elevator muscles because ramus osteotomy allows the muscles to shorten as the chin goes down but the gonial angles go up.

Relapse of overbite correction following mandibular subapical advancement also is likely to occur, due to strong musculature in short face patients. One reason for considering mandibular subapical advancement rather than a ramus osteotomy is the tendency for these patients to have a prominent chin relative to their dentition. If face height is only slightly short and overbite is not a major problem the subapical osteotomy may be an ideal solution, but if significant vertical change is needed, a ramus osteotomy is needed.

The surgical treatment options⁵⁶ in deep bite patients are

1. Orthodontics and interpositional genioplasty
2. Orthodontics and Inferior onlay mandibuloplasty
3. Orthodontics and mandibular advancement
4. Orthodontics and total subapical mandibular advancement
5. Orthodontics and inferior repositioning of maxilla and mandibular advancement
6. Orthodontics and combined maxillary and mandibular surgery

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