Lec. 5 Treatment of Class II div.1 malocclusion

Class II can be divided into two types:

1- Class II division 1.

2- Class II division 2.

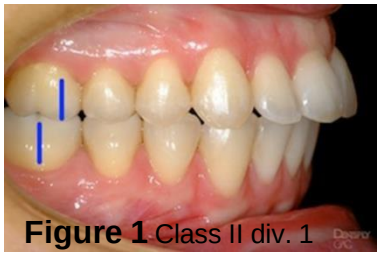

Figure 1 Class II div. 1

1. Class II div. 1

It can be defined according to the angle classification that the mesiobuccal cusp of the upper 1st permanent molar pass ½ cusp or complete cusp to the mesiobuccal groove of the lower 1st permanent molare (Fig. 1). The British Standards classification defines a Class II division 1 incisor relationship as follows: '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'. On other hand, the upper canine is either ½ cusp or completely anterior to the lower canine. Patient with Cl II sometimes is seen to have Cl I molar classification but there is an anterior teeth proclination i.e. increase over jet. Or, we can see that the canine classification is Cl I while the molar relation is Cl II. In a Caucasian population the incidence of Class II division 1 incisor relationship is approximately 15–20 per cent. The Cl II occlusal relationship provides the major load of treatment with orthodontic appliance treatment in many communities. Sometimes skeletal Cl I or mild Cl III can be associated with Cl II dentinal pattern especially in the presence of bad habits or abnormal breathing.

1.1 Aetiology

1.1.1 Skeletal pattern:

A Class II division 1 incisor relationship is usually associated with a Class II skeletal pattern, commonly due to a retrognathic mandible (Fig. 2). However, proclination of the upper incisors and/or retroclination of the lower incisors by a habit or the soft tissues can result in an increased overjet on a Class I (Fig. 3), or even a Class III skeletal pattern.

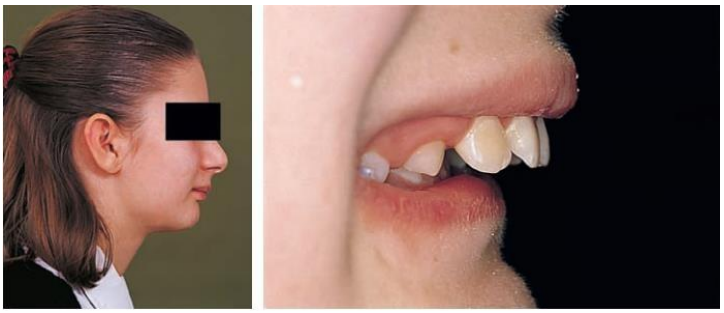

Figure 2 A Class II division 1 incisor relationship on a Class II skeletal pattern with a retrognathic mandible.

A Class II division 1 incisor relationship is found in association with a range of vertical skeletal patterns. The vertical relationship of Cl II malocclusion can be present with either increased or reduced lower facial height .Management of those patients with significantly increased or significantly reduced vertical proportions is usually difficult and is the field of the specialist.

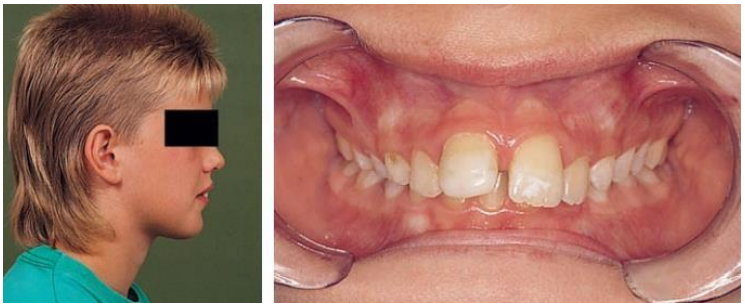

Figure 3 A Class II division 1 incisor relationship on a Class I skeletal pattern

1.1.2 Soft tissues factor:

In general, the resting position of the patient's soft tissues and their functional activity are important with Cl II div. 1 malocclusion.

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, the patient will try to achieve an anterior oral seal in one of the following ways:

- Circumoral muscular activity to achieve a lip-to-lip seal.
- The mandible is postured forwards to allow the lips to meet at rest.
- The lower lip is drawn up behind the upper incisors
- The tongue is placed forwards between the incisors to contact the lower lip, often contributing to the development of an incomplete overbite.
- A combination of these.

The lip-to-lip contact by circumoral muscle activity or mandibular forward positioning will moderate the effect of the underlying skeletal pattern by dentoalveolar

compensation through the influence of the soft tissues.

More commonly, the retraction of lower lip behind the upper incisors will lead 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.

However, if the tongue habitually comes forward to contact the lower lip, proclination of the lower incisors may occur, helping to compensate for the underlying skeletal pattern. This kind of tissues behaviour is often associated with increased vertical skeletal proportions and/or grossly incompetent lips, or a habit which has resulted in an increase in overjet and an anterior openbite.

1.1.3 Dental factors:

A Class II division 1 incisor relationship may occur in the presence of crowding or spacing. Where the arches are crowded, lack of space may result in the upper incisors being crowded out of the arch labially and thus to exacerbation of the overjet. Conversely, crowding of the lower labial segment may assist to compensate for an increased overjet in the same manner.

1.1.4 Habits:

The aetiology of a class II division 1 incisor relationship can also be due to a digit sucking habit that persists beyond eruption of the permanent maxillary incisors. Generally, the severity of habits will depend upon the duration, frequency and intensity.

The following features are commonly associated with a determined habit:

- Proclination of the upper incisors;
- Retroclination of the lower labial segment;
- An incomplete overbite or a localized anterior open bite;
- Narrowing of the upper arch thought to be mediated by the tongue taking up a lower position in the mouth and the negative pressure generated during sucking of the digit.

The first two effects will contribute to an increase in overjet. The effects of a habit can lead to an increased overjet in a child with a Class I or Class III skeletal pattern, or can exacerbate a pre- existing Class II malocclusion.

1.2 Occlusal Features:

- Class II molar relation.
- Class II incisor relationship due to increased overjet.
- Overbite is frequently deep.
- If associated with thumb sucking, incomplete overbite or open bite.

- Deep curve of Spee *(The normal occlusal plane of the maxillary and mandibular dental arches follows a curve in the anteroposterior plane, producing the curve of Spee. Any significant increase or decrease of the curve along either occlusal plane can influence the vertical dental relationship).*
- Canine relationship will be Class II.
- Crossbite and scissor bite may occasionally be present.

1.3 Facial Growth

Varying types of growth pattern are seen:

- Cases with horizontal growth pattern respond well to functional appliance therapy.
- Vertical growth patterns are difficult to treat (Unfavourable growth pattern).

1.4 Factors influencing a definitive treatment plan:

There are many factors that must be taken in our consideration during treatment.

1.4.1 Age of patient.

Whether further facial growth is to be expected and whether this is likely to be favourable or unfavourable. Forward growth of the mandible that occurs during the pubertal growth spurt and the early teens is advantageous in the management of Class II malocclusions. While, increased vertical skeletal proportions and a backward-opening rotational pattern of growth have a poorer prognosis for stability. This is because the anteroposterior discrepancy will worsen with growth; in addition, increasing the height of the lower face may reduce the likelihood of lip competence at the end of treatment.

In an adult patient, the lack of growth will reduce the possibility of treatment of skeletal class II malocclusion with orthodontic means alone and require more complicated methods.

1.4.2 Severity of the cases:

The major determinant of the difficulty of treatment is the skeletal pattern. Careful evaluation will be required to treat those cases with a marked anteroposterior discrepancy and/ or significantly increased or reduced vertical skeletal proportions.

1.4.3 Patient cooperation:

Successful orthodontic treatment requires significant cooperation and compliance, which some patients find difficult. This is less of a problem with adult patients who are generally highly motivated towards treatment, but in children and adolescents high discontinuation rates have been reported. The patient's cooperation is a prerequisite for a good clinical

effect. Cooperation is the most important factor influencing the success rate of the functional orthodontic appliance.

1.5 Treatment plan for Class II malocclusion in growing patient:

1.5.1 Correction of Skeletal Class II Malocclusion:

➢ **Prognathic maxilla:**

- Growth inhibition of the maxilla for prognathic maxilla, with distalization of upper buccal segments is achieved by using extraoral orthopedic force.
- Headgears are used for orthopedic force.
- Patient wears the appliance for 12–14 hours a day.
- Orthopedic force of 350–450 grams/side is applied.
- High-pull or occipital-pull headgear is used for vertically growing patients.
- Cervical-pull headgear is used for horizontal growing patients.

➢ **Retrognathic mandible:**

- Growth stimulation of the mandible (during a period of maximal growth spurt) is induced using functional appliances.
- Functional appliances act by placing the mandible in anterior position and also by eliminating functional retrusion.
- Commonly used functional appliances for Class II correction are activator, Frankel, twin block and bionator.
- During late mixed dentition in children with residual post-pubertal growth (either during the pre-pubertal peak or in early adolescence), fixed functional appliances, like Herbst, Jasper jumpers, are used.
- Many studies have demonstrated that the Herbst could be used just as effectively for overjet and molar correction after the pubertal growth peak.

➢ **Combination of prognathic maxilla and retrognathic mandible:**

- Growth modification is done by combination of headgear and functional appliances.
- Activator with headgear is commonly used.

Clinical use of functional appliances

The ideal case for treatment with a functional appliance should have the following clinical features:

1. Increased overjet and class II buccal segment relationship;
2. Mild to moderate skeletal class II base;
3. Average to reduced lower face height;
4. Proclined maxillary incisors;
5. Retroclined mandibular incisors; and
6. Active growth

1.6 Management of Class II division 1 malocclusion in Adults:

1.6.1 Treatment objectives in Class II division 1:

1. Relief of crowding and local irregularities.
2. Establish normal overbite
3. Reduction of incisal overjet.
4. Correction of Cl II relationship of the buccal teeth and canine relation.
5. Improving facial esthetics.

1.6.2 Treatment Plan for Class II Correction in Adults

1.6.2.1 Orthodontic treatment and Orthodontic camouflage:

- **Indications are:**

- Patients too old for growth modulation.
- Correction of dentoalveolar Class II with Class I skeletal base.
- Mild or moderate skeletal class II.

Treatment using removable appliance:

This can be done in a patient with Cl II div.1 on Class I skeletal or mild Cl II skeletal pattern and the canine is mesial angulation. The extraction can be performed at the upper arch but not in the lower arch and the patient is cooperative.

Important note: the correction of overbite should be done before the overjet correction in Class II div. 1.

Stage 1:

Create space by extracting the upper 4s and then using removable orthodontic

appliances. Design of upper removable appliance (Fig. 4):

1- Adams clasp on the upper 5s and 6s to increase the retention of the appliance.

2- Modified finger spring on the upper 3s for distal movement.

If the canines within the dental arch, however if the canines are buccally malposed, modified buccal canine retractor can be used to correct the canine.

3- Fitted labial arch to increase the retention of the appliance anteriorly.

4- Acrylic base plate to collect the springs and clasps.

5- Use the anterior bite plane to reduce the overbite either flat or inclined depending on the axial relation of the lower incisors to the mandibular plane. If the long axis of the lower incisors is perpendicular on the mandibular plane the flat anterior bite plane can be indicated otherwise the inclined one can be used.

At the end of the stage the canines were retracted and the overbite was corrected.

Stage 1 for about 5-6 months.

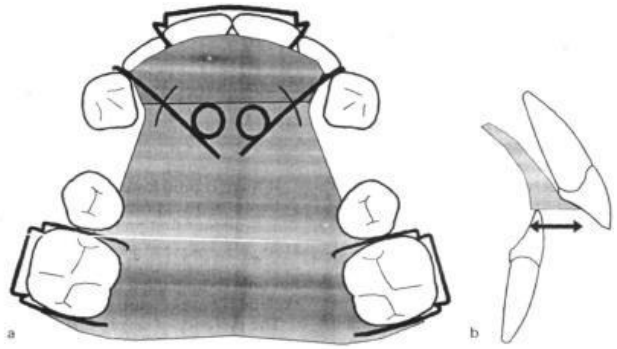

Figure 4 (a) An appliance with palatal canine retractors (0.5 mm) and a double Adams' clasp on 1|1 (0.7 mm), (b) The upper bite plane should only extend sufficiently posteriorly just to engage the lower incisors.

<u>Stage 2</u> (**<u>Fig. 5):</u>**

1- Double Adams clasp on the upper 5s and 6s.

2- Stoppers mesial to upper canines to prevent their relapse.

3- Anterior bite plane is continued to be used to prevent the relapse of deep overbite.

4- Ropert retractor is used to retract 1s and 2s; the activation of acrylic behind 1s and 2s is done with closing the coils of the retractor about 2mm to reduce the overjet; the amount of activation can be done every 2-3 weeks interval.

At the end of this stage, the incisors should be retracted into a class I incisors relation.

Stage 2 for about 4 months.

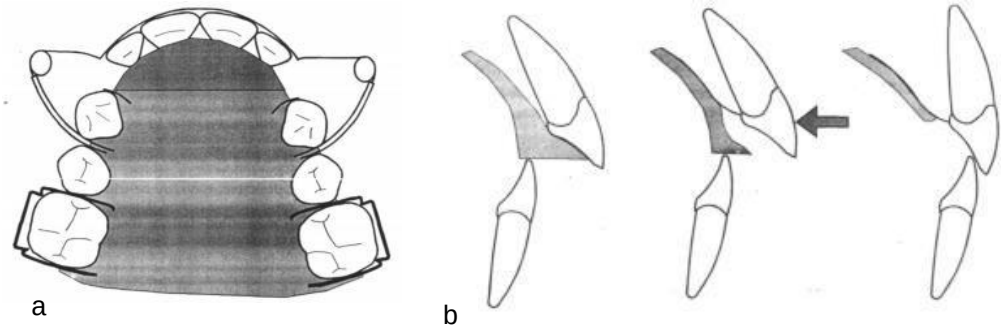

Figure 5 (a) A Roberts' retractor (0.5 mm in 0.5 mm ID tubing), (b) The overbite should be fully reduced before overjet reduction is commenced. The fit surface of the bite plate should be trimmed progressively, ensuring that the overbite reduction is held while making space for the upper incisors to be retracted. The anterior border of the bite plane should be kept in a smooth curve.

Stage 3:

Retainer for teeth retention:

1- Adams clasp on the upper 6s; there is no need for double clasps.

2- Hawley arch.

The retainer is usually worn at day and night for about 3 months and then is followed by wearing the appliance, only during night for the last 3 months.

Nowadays, invisible clear acrylic retainer is used for retention.

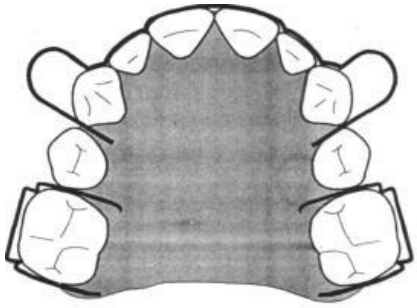

Figure 6 A Hawley retainer

- ***Step by step instructions for removable appliance:***

1- You must check the appliance design that you have written to the technician, and the name of the patient.

2- Checking for any roughness in the appliance (acrylic part).

3- Checking for any traumatic ends in the wire.

4- Insert the appliance passively inside the patient mouth to check the fullness of the acrylic with the soft tissues.

5- Adjust the retentive part of the appliance.

6- A very small amount of activation can be done at the time of insertion. Another option is to insert the appliance passively without any activation and on the second appointment, which is about a week after the insertion, the appliance can be activated.

Treatment using fixed appliance:

The fixed orthodontic appliance is indicated for the following:

1- When the canine is vertically or distally angulated; so it needs for bodily tooth movement and not for tipping tooth movement.

2- Upper incisors are not proclined.

3- Presence of rotation more than 90 degrees.

4- Moderate or severe class II.

5- Residual space after overjet correction.

6- Adult patient with increased overbite.

7- Class II malocclusion which is associated with any vertical or transverse

discrepancy. The use of fixed appliances is the job of specialist.

How to calculate the spaces used for treatment ?

[1] = (O.J-2)∗2 – spacing.

Or

[2] = (O.J-2)∗2 + crowding.

1.6.2.2 ***Surgical correction:***

The use of surgery is done in non-growing adults. In severe Class II skeletal malocclusion, surgery is the appropriate form.

- The various surgical procedures carried out are:

1. Prognathic maxilla: (a) Le Fort I osteotomy, (b) anterior maxillary osteotomy.
2. Retrognathic mandible: (a) sagittal split, (b) oblique osteotomy—advancement procedure.
3. Combination: Bi-jaw surgery with genioplasty, if required.