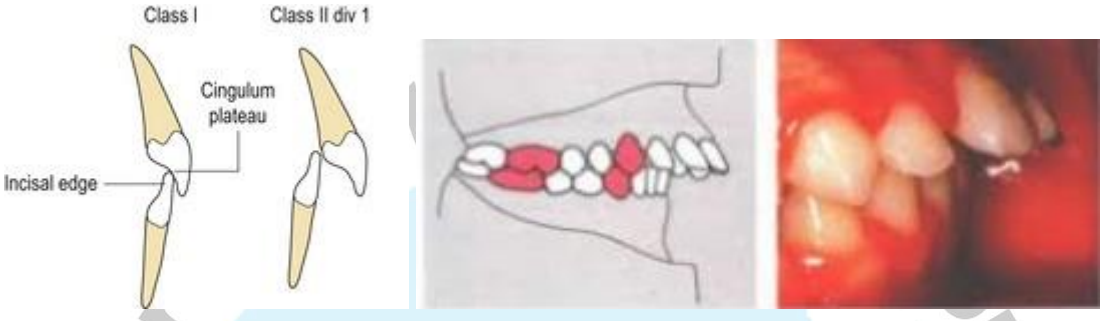
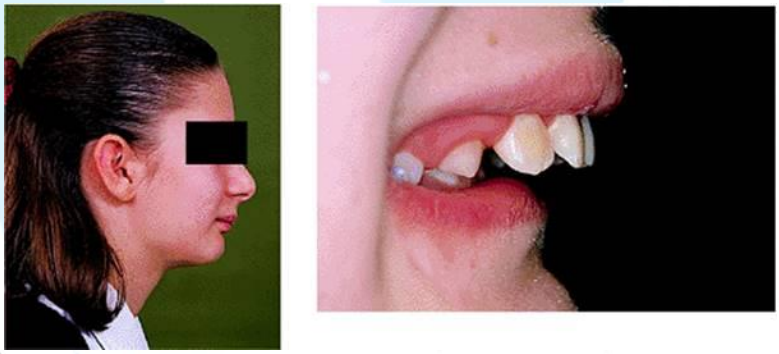
Treatment of Class II division 1 malocclusion

The British Standards classification defines a Class II div.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'. In a Caucasian population, the incidence of Class II div.1 incisor relationship is approximately 15–20%.



Etiologies of Class II Div.1 malocclusion

Skeletal factor: A Class II div. 1 incisor relationship is usually associated with a Class II skeletal pattern, commonly due to a retrognathic mandible.



More rarely, it is possible for patients with a Class II div. 1 incisor relationship to have a Class I (or even a Class III) skeletal pattern. This can occur when the upper incisors are proclined and/or the lower incisors are retroclined, either by the soft tissues or a habit.



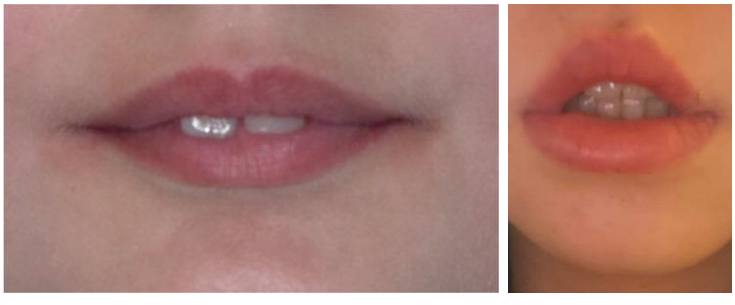


A Class II div. 1 incisor relationship is found in association with a range of vertical skeletal patterns and asymmetries. As a general rule, the more significant the underlying skeletal discrepancy in any plane, the more difficult it is to treat.

Soft tissue factor: The tongue, lips, and cheeks can be etiological factors in a Class II div.1 malocclusion. The influence of the soft tissues on a Class II div.1 malocclusion is mainly mediated by the skeletal pattern, both anteroposteriorly and vertically. However, the resting position of the patient's soft tissues and their functional activity can also be important.

In a Class II div.1 malocclusion, the lips are often incompetent due to the prominence of the upper incisors and/or the underlying skeletal pattern.





If the lips are incompetent, a patient can try to achieve an anterior oral seal in a number of different ways. The way of achieving this anterior oral seal will affect the presentation of the Class II div.1 incisor relationship.

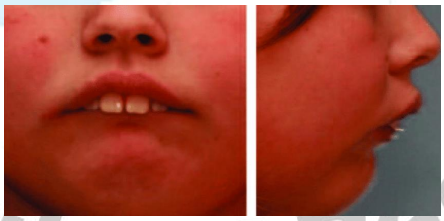
The different methods of achieving an anterior seal:

1- Circumoral muscular activity to achieve a lip-to-lip seal: Where the patient can achieve lip-to-lip contact by circumoral muscle activity, the influence of the soft tissues is often to moderate the effect of the underlying skeletal pattern by dento-alveolar compensation. The action of achieving lip-to-lip contact will tend to mould the upper incisors back, reducing the overjet.



2- The mandible is postured forwards to allow the lips to meet at rest. In these circumstances the soft tissues promote dentoalveolar compensation and reduce the influence of the Class II skeletal pattern.

3- The lower lip is drawn up behind the upper incisors: If lip-to-lip contact is not possible, which is more likely as the skeletal pattern becomes more severe, the lower lip functions by being drawn up behind the upper incisors. The effect of this is to retrocline the lower labial segment and/or procline the upper incisors, resulting in an incisor relationship that is more severe than the underlying skeletal pattern.



4- The tongue is placed forwards between the incisors to contact the lower lip: 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 type of soft tissue 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 open bite.



Infrequently, a Class II div1 incisor relationship occurs as a result of retroclination of the lower incisors by a very active lower lip sometimes referred to as 'strap-like'. The prognosis for stable overjet reduction in these circumstances is poor.



Dental factors: A Class II division 1 incisor relationship may occur as a result of crowding. Due to the shortage of space, the upper incisors may be displaced labially leading to an increased overjet. It is also possible to have an increased overjet as a result of an ectopic incisor that has developed labially. Treatment of the increased overjet in these situations is aimed at creating space to relieve the crowding and/or bringing the ectopic tooth back into the line of the arch



Habit: An increased overjet can be the result of a persistent digit-sucking habit. A prolonged force on the teeth from the digit lasting several hours a day is sufficient to move teeth. The severity of the effects produced will depend upon the duration and the intensity.

The following 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 (so it no longer balances the inward pressure from the cheeks) and also the negative pressure generated during sucking of the digit.

It is vital that the habit is broken before any treatment begins



The effects may be asymmetric if a single finger or thumb is sucked



Objectives of Class II Div.1 malocclusion treatment

Aesthetic: In order to achieve a good aesthetic result, it is important to consider the patient's facial and smile aesthetics. Simply reducing an overjet, without considering the position of the teeth within the face and relation to the lips, will not necessarily produce an aesthetic result.

Oral health: One major objective for treating class II div.1 malocclusions is to reduce the risk of traumatic injuries.

The risk of injury increases with overjet size and lip incompetence. Increased overjet and increased vertical proportions can sometimes lead to grossly incompetent lips which are habitually apart at rest. This can result in drying of the gingivae, exacerbating any pre-existing gingivitis. Reducing the overjet to improve lip incompetence may help reduce this drying effect.

Due to the high incidence of trauma, orthodontic patients should be questioned about, and examined for, past episodes of trauma. The history

should include details of the event, the extent of the injury and any treatment provided, as well as any longterm complications. Any teeth which have, or are suspected to have, suffered from trauma should be assessed with long-cone periapical radiographs and a thorough clinical examination including the tooth color, mobility, tenderness to percussion, and tenderness of the associated soft tissues along with sensibility tests. Teeth which have undergone an episode of trauma should be monitored prior to commencing any orthodontic treatment. The period of observation will depend on the severity and occlusal consequences of the trauma. A minimum of 3 months should be allowed for crown fractures, concussion, subluxation, extrusion, and mild lateral luxation. Whereas at least 6 months, and ideally 12 months, should pass before orthodontic movement is undertaken on teeth which have suffered a lateral luxation involving a moderate to severe displacement, intrusion, and avulsion with reimplantation. If a tooth becomes non-vital then root canal therapy should be undertaken, with monitoring to ensure the treatment has been successful, prior to commencement of orthodontic treatment. The dental trauma results in severely displaced tooth positions which interfere with the occlusion, and then they can be manually repositioned in the immediate aftermath of the incident. If this is not possible, then consideration can be given to orthodontic repositioning using very light forces.

Function: Although aesthetics and health issues may be more common reasons for treating a Class II division 1 malocclusion, it is important to aim for a functional result that allows the patient to incise foods normally.

Stability: The soft tissues are the major determinant of stability following overjet reduction. The stability of overjet correction is reliant upon ensuring that the upper incisors are retracted sufficiently to be in control of the lower lip. Ideally, at the end of overjet reduction the lower lip should lie on the labial incisal one-third of the upper incisors and the patient should be able to achieve a competent lip seal.

If it is not possible to get the upper incisors under the control of the lower lip at the end of orthodontic treatment, additional fixed retention may be indicated, or in some cases surgical input may be required.



Treatment planning of class II division 1 malocclusion

A full history, examination, and special tests will have identified a list of problems, including the increased overjet and any associated class II skeletal discrepancy. From this, a list of aims can be produced, identifying which problems will be addressed and which will be accepted. Once the aims are established, possible solutions can be considered. Of particular relevance to treatment planning for class II division 1 malocclusions are:

- Etiology.
- Age of the patient.
- Anchorage.
- Retention.

1- Aetiology

It is important to identify the etiology of the increased overjet, as this will determine the appropriate treatment plan. If there is an underlying skeletal etiology then a decision needs to be made whether to accept the underlying skeletal component and move the teeth into a class I relationship "*orthodontic camouflage*" or to try to modify the skeletal component "*growth modification*", or to use a combined orthodontics and surgical approach "*orthognathic surgery*".

If there is a soft tissue cause to the malocclusion, then the treatment plan should aim to place the teeth in such a position that the lips will meet passively in a competent position at rest.

Addressing underlying dental causes of an increased overjet are usually simpler, as this typically involves relieving crowding and/or aligning irregular teeth.

If habits are contributing to this type of malocclusion it is vital that the habit is broken before any treatment begins, as the pressures from the digit are likely to inhibit the corrective forces of any orthodontic appliances, and certainly would significantly increase the risk of any relapse

2- <u>Age</u>

The patient's age is important as it will determine whether there will be any further significant facial growth. This is important for two reasons:

- Future growth—favourable or unfavourable
- Utilizing favourable growth for treatment

In the 'average' growing child, forward growth of the mandible occurs during the pubertal growth spurt and the early teens. This is advantageous in the management of Class II malocclusions. However, correction of the incisor relationship in a child with increased vertical skeletal proportions and a backward-opening rotational pattern of growth have a poorer prognosis. This is because the anteroposterior

discrepancy will worsen with growth, and in addition an increase in the lower face height may reduce the likelihood of lip competence at the end of treatment. In a growing patient, growth modification may be used to correct underlying Class II skeletal problems, and it is also makes it easier to treat other possible aspects of the malocclusion, such as a deep overbite.

3- <u>Skeletal problems</u>

Patients with an underlying skeletal discrepancy (usually Class II), can be treated by:

- Orthodontic camouflage
- Growth modification
- Combined orthodontic and surgical approach.

Orthodontic camouflage can be used to treat class II division 1, by moving the teeth into a class I relationship, but accepting the underlying skeletal discrepancy. This is usually more likely when the skeletal contribution to the malocclusion is small and may involve allowing the lower incisors to come forwards, or retracting the upper incisors, or both.

Retracting the upper incisors sometimes requires space to be created to move the incisors into. This space can be created by teeth extractions or interproximal reduction of enamel. Space can also be created by distalization of the upper molars with headgear or from temporary anchorage devices.

Growth modification is possible in growing patients. This can be undertaken with headgear or functional appliances. It is likely that any skeletal changes are minimal and that the majority of changes are dento-alveolar, however these orthodontic appliances often offer an efficient way to correct the more severe class II division 1 malocclusions. However, the controversial area of growth modification treatment of class II division 1 malocclusions with functional appliances is the timing of treatment (Early typically before the age of 10 years in the mixed dentition or in the late mixed dentition).

Starting treatment earlier takes longer, requires more compliance from patients, and does not result in a better final result, either occlusally or skeletally; however, it is indicated to reduce the risk of incisal trauma or when a patient is being teased or bullied about their Class II division 1 malocclusion.

Combined orthodontic and orthognathic surgery treatment is usually reserved for adults with more severe skeletal discrepancies that are beyond the scope of orthodontics alone or where orthodontic camouflage would produce a compromised facial result.

Anchorage

Anchorage is needed to minimize the unwanted tooth movement. In the treatment of Class II div.1 malocclusions, there is often a challenge in keeping the upper posterior teeth still while retracting the upper labial segment to reduce an overjet.

Retention

Retention is a vital part of any orthodontic treatment plan. Of particular relevance to retaining the result of corrected Class II division 1 malocclusion is to ensure the upper incisors are under control of the lower lip at the end of treatment, to help minimize relapse of the overjet.

Key points

- Class II division 1 malocclusions are commonly associated with an underlying Class II skeletal pattern with a retrusive mandible.
- When treating Class II division 1 malocclusions, it is important to identify the aetiology, which can be skeletal, due to soft tissues, dental factors, or habits.
- For cases with an underlying Class II skeletal pattern, the options are growth modification, camouflage, or surgery.
- Growth modification can only be undertaken in growing patients.
- Stability of treated Class II division 1 malocclusions is improved if the upper incisors are under the control of the lower lip at the end of treatment.

References:

1- Littlewood SJ, Mitchell L. (2019): An introduction to orthodontics. 5th edition. Oxford University Press.
2- 2- Phulari BS. (2017): Orthodontics: principles and practice: 2 nd edition. Jaypee. 2017