



Australian Society  
of Orthodontists



THE UNIVERSITY OF  
SYDNEY



# CLASS II DIVISION 2 MALOCCLUSION

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# Class II Division 2 Malocclusion

## Introduction

Over a century ago Angle divided malocclusions into four groups: Class I, Class II division 1, Class II division 2 and Class III and is still the most used and recognised classification today. It allows us to quickly visualise and recognise patterns, focus our diagnosis and commence treatment planning so it can be implemented more efficiently and effectively.

A Class II malocclusion is present when the mesiobuccal cusp of the maxillary first molar occludes mesial to the mid buccal groove of the mandibular first molar. Angle and subsequent authors differentiated between Class II division 1 and 2 malocclusions based on the position of the incisors. A Class II division 2 (II/2) relationship describes the malocclusion where:

- The lower incisors occlude palatal to the cingulum of the upper incisors and may produce trauma to the palatal tissues.
- The upper central incisors (and usually the lower incisors) are retroclined.
- The overjet is minimal (however it can be normal or increased).

The incidence of Class II/2 malocclusion is reported to be about 7% within the Australian population (Tod 1997), 10% in the United Kingdom, 3 – 4% in the United States (Ghafari 2014) and 2.7% in China (Lew et al 1993). These figures of course vary based on racial demographics.

## Aetiology

There is a strong genetic component to the development of a Class II/2 malocclusion. Twin studies demonstrate that this malocclusion is inherited either as an autosomal dominant trait with incomplete penetrance and variable expressivity, or as polygenetic expression of key morphological traits (Markovic 1992, Mossey 1999). Furthermore, aspects of musculoskeletal morphology such as jaw shape and size, and dental development such as tooth size, shape and number, are genetically pre-determined. These dentoskeletal factors can contribute to the development of this malocclusion.

Epigenetic factors, such as presence of a high lip line, an expressive ‘strap like’ lower lip and hyperactivity of the mentalis muscles can disrupt the equilibrium of orofacial forces and result in the retroclination of the maxillary incisors (Mossey 1999). This can result in an increased inter-incisal angle and predispose to an increased overbite.

## Clinical Features

Typically in Class II/2 malocclusions the maxillary central incisors are retroclined and the adjacent lateral incisors are of an average or proclined angulation. However, if the lower lip line covers the incisal portion of the maxillary lateral incisors, these teeth can also become retroclined.

When compared to other malocclusions, Class II/2 malocclusions are more closely associated with congenital tooth anomalies including hypodontia, microdontia, malformations of maxillary lateral incisors and tooth transpositions (Basdra 2000).

TABLE 1: TYPICAL FEATURES ASSOCIATED WITH CLASS II/2 MALOCCLUSIONS

DENTAL	SKELETAL/RADIOGRAPHIC	SOFT TISSUES
<ul style="list-style-type: none"><li>• Increased overbite</li><li>• Reduced overjet</li><li>• Class II buccal segments</li><li>• Retroclined maxillary central incisors</li><li>• Flared maxillary lateral incisors</li><li>• Poorly developed cingulum of maxillary incisors</li><li>• Increased inter-incisal angle</li><li>• Attrition affecting mandibular incisors</li><li>• Retroclined or upright mandibular incisors</li><li>• Congenital tooth anomalies</li><li>• Supra-erupted maxillary incisors</li><li>• Under erupted molars</li><li>• Increased curve of spee</li><li>• Increased freeway space</li><li>• Tendency for premolar buccal crossbite</li></ul>	<ul style="list-style-type: none"><li>• Skeletal II Base with straight to convex profile</li><li>• Forward rotating mandible</li><li>• Increased maxillary transverse dimension</li><li>• Reduced lower anterior facial height</li><li>• Increased ramal and posterior facial height</li><li>• Reduced gonial and mandibular plane angles</li><li>• Wider temporomandibular joint space anteriorly</li><li>• Retroclined symphysis</li><li>• Increased incisal column angle</li></ul>	<ul style="list-style-type: none"><li>• High lip line</li><li>• Smaller upper vermillion border</li><li>• Expressive ‘strap like’ lower lip</li><li>• Higher level of lower lip to upper incisors</li><li>• Everted lower lip</li><li>• Hyperactive Mentalis and Orbicularis Oris musculature</li><li>• Deep labiomental fold</li><li>• Prominent chin</li><li>• Larger masseter muscles with well-developed mandibular angles</li></ul>

Furthermore 44% of individuals with palatally displaced permanent canines have an underlying Class II/2 malocclusion. This may be in part caused by the increased maxillary transverse dimension and/or lateral incisor microdontia (Al-Nimry 2005).

Mossey (1999) reported a high incidence of recurrent morphometric features in individuals with Class II/2 malocclusion and hence considered this malocclusion akin to a syndrome. The key clinical features are outlined in Table 1. It should be noted that not all individuals with a Class II/2 malocclusion will exhibit all of the listed features, and that the division between Angle's four types of malocclusions are blurred in many individuals.



**Figure 1:**  
*Intraoral photographs illustrating some key clinical features in a patient with a Class II/2*

## Treatment

Treatment of a Class II/2 malocclusion should address the aetiology and is dependent on the patient's age, compliance, underlying skeletal pattern and dental characteristics. Smile aesthetics should also be addressed. Stable correction of the overbite and inter-incisal angle are key dental aims of treatment.

## Correction of increased inter-incisal angle

To create an effective occlusal stop, the inter-incisal angle should be about 135° and the lower incisor edges should lie within 2 mm of the maxillary central incisor centroid. Techniques to achieve this include increased palatal root torque to the maxillary incisors, and proclination of the maxillary and mandibular anterior segments. Sufficient palatal cortical bone is required to torque the incisor roots palatally, and this can tax anchorage requirements. Large labial movements should be avoided in the mandibular labial segment in patients with a thin gingival biotype due to the risk of loss of periodontal attachment. Any significant increase in the inter-canine width is unstable and therefore long term permanent retention will be required.

## Correction of increased overbite

Molar extrusion and incisor intrusion are common techniques for reducing a dental deep bite. In reality, a combined approach is taken as absolute intrusion is difficult to achieve. The choice to extrude posteriorly or intrude anteriorly should be based on the patient's incisor display on smiling and at rest. Proclination of the mandibular incisors can reduce the overbite, however care must be taken to ensure the correct inter-incisal angle is achieved.

Absolute intrusion is more often used in patients with limited growth potential. Auxiliary arches, for example, the Burstone Intrusion Arch and Mulligan bypass arch, can be used. Skeletal anchorage devices such as miniscrews can be used in conjunction with clear aligners and fixed appliances to enhance intrusion mechanics.

In growing children, relative intrusion of the anterior segment occurs as the incisors are held in position while vertical facial development, molar eruption and facilitated molar extrusion occur. Guided molar eruption can also occur using anterior bite turbos or an upper removable appliance with an anterior bite plane – the latter is compliance dependent. Molar and premolar extrusion is less stable in non-growing patients (Wylie 1944, McDowell 1991) as the inter-occlusal forces tend to re-intrude the molars once active appliances are withdrawn. However, if effective interdigitation, occlusal stops and restoration of the ideal inter-incisal angle are achieved, this tendency for relapse is reduced. Molar extrusion can result in a down and backward rotation of the mandible and a subsequent increase in lower anterior face height. This may be desirable as many Class II/2 patients are brachyfacial, but undesirable in dolichofacial patients with moderate to severe mandibular retrognathia.

Deep bite correction is more effective during puberty, compared to pre-puberty (Franchi 2006). In growing patients with a skeletal Class II base, headgear treatment may be useful to distalise or hold back the maxillary teeth as the patient is growing. Similarly, a functional appliance may be useful to help advance the lower arch. Before functional appliances can be used in Class II/2 cases, the upper incisors must first be proclined to provide sufficient overjet to enable mandibular advancement.

If a removable functional appliance is used the upper incisor proclination may be best achieved with either sectional fixed appliances, or a removable appliance with an anterior screw or springs palatal to the maxillary anterior segment. Following functional treatment, fixed appliances or clear sequential aligner therapy is required to establish a good stable occlusion and alignment of the teeth. An alternative treatment modality is to use fixed Class II correctors or Class II elastics as adjuncts to full fixed appliances.

As individuals with a Class II/2 malocclusion often have less crowding and straight to concave lower third facial profiles, there is a greater tendency for these patients to be treated on a non-extraction basis. Where extractions are required more posteriorly placed teeth are frequently chosen. Non-growing patients with a severe dental discrepancy on a significant Skeletal II base may require Orthognathic surgery.

Preliminary research on rats indicated that Botulinum Toxin, when injected into masseter muscles caused a reduction

in occlusal forces, and resulted in supra-eruption of the molars and incisors (Seok 2018). More research on human subjects is required to evaluate the effect and stability of Botulinum Toxin induced dental extrusion.

Long term post treatment retention is necessary to prevent relapse of anterior crowding, intercanine width collapse and the reestablishment of a deep anterior overbite. If molar extrusion was a key aim of treatment, a removable retainer with an anterior bite plane may be useful to reduce overbite relapse.

## Conclusion

Recognising a Class II/2 malocclusion allows the clinician to focus their treatment planning and treatment delivery in a more effective and efficient manner. The establishment of a good interincisal angle and good interdigitation of the occlusion is important in gaining and maintaining a stable result. Long term retention is important to enhance stability.

## References available upon request



Figure 2:  
Pre and post treatment photographs of a patient with a Class II/2 malocclusion.

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