

Australian Society
of Orthodontists



University of Sydney



Class II Division 1 Malocclusions –
Early Diagnosis & Management

PART II

Creating Brighter Futures

Part I of this publication summarised the definitions, aetiology, diagnosis and early treatment for patients with Class II Division 1 malocclusions in the mixed dentition. Part II will summarise and discuss the arguments for and against early Class II correction.

If undertaken, early or mixed dentition – Phase 1 – treatment of Class II Division 1 malocclusions is usually followed later by comprehensive – Phase 2 – treatment during adolescence and in the permanent dentition. Phase 2 treatment will gain further Class II correction and detail the alignment and occlusion¹.

Why treat Class II Malocclusions Early?

Growth potential

It is generally believed that the best orthopaedic (skeletal) results are achieved during the most active periods of growth. Somatic and craniofacial growth rates are more intense in earlier years than in later stages of development², and hence can be utilised by undertaking early treatment. Longitudinal data³, supported by experimental work on monkeys^{4,5}, have shown a "juvenile acceleration" in jaw growth that can occur several years before the pubertal growth spurt (Figure 1)⁶. However, there is significant inter-individual variation, and clinically significant juvenile mandibular growth spurts may not occur in some patients⁷.

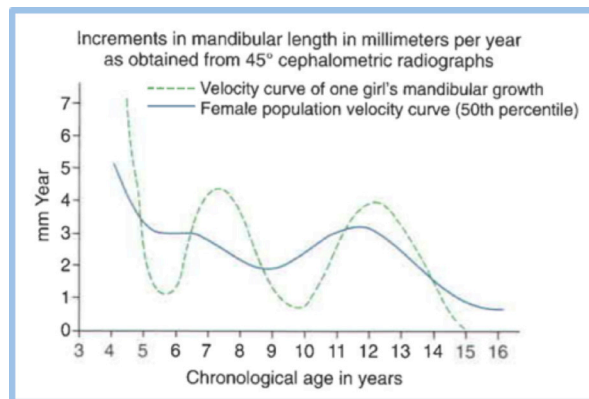


Figure 1. Longitudinal data for mandibular growth (adapted from Burlington growth study)⁶

Major Trauma

Studies^{8,9} show an association between increased overjet and risk of upper incisor trauma (Figure 2). By age 12, the prevalence of dental trauma in children with overjet greater than 9mm is 45%, double that of children with overjet less than 9mm⁸. However, lip incompetence has been shown to be a more significant risk factor, increasing

the risk for dental trauma by a factor of 1.6 to 2.0, as well as increasing the number of teeth involved in the event^{10,11}. Although other factors do affect the prevalence of incisor trauma, such as playing sport and having an accident-prone personality⁹, the literature supports the role of early treatment in reducing the incidence of dental trauma¹⁰.



Figure 2. Large overjets may predispose children to upper incisor trauma.

Psychology

Children with severe Class II malocclusions, especially with proclined upper incisors, are at risk of suffering psychosocially, and can become victims of teasing by their peers^{12,13}. It is therefore reasonable to expect that early Class II treatment will provide significant psychosocial benefits to those children who are being teased at school¹⁴, or whose self-esteem or confidence is being detrimentally affected by the way they or others perceive their appearance. Further, there is evidence to show that even children as young as 9 years of age have psychological strengths that allow them to understand and be motivated to receive early Class II treatment¹⁵.

Sleep apnoea

Obstructive sleep apnoea (OSA) is characterised by the physical blockage of the upper airways during sleep, causing periods of complete cessation (apnoea) or partial cessation (hypopnoea) of airflow, and is relatively common in childhood¹⁶. The risk factors for OSA in children include adenotonsillar hypertrophy, obesity, neuromuscular dysfunction and craniofacial anomalies (Figure 3). It has been hypothesised¹⁷ that because a high number of OSA patients have skeletal Class II problems, due to small or retrognathic mandibles, early Class II treatment during growth may be effective in preventing or reducing the development of OSA, both in the short term and in later stages of life. Although there is a lack of evidence to confirm this hypothesis, a recent Cochrane review did not exclude the role of early Class II treatment in preventing or reducing OSA, concluding that "functional orthopaedic appliances may be helpful in the treatment of children with craniofacial anomalies which are risk factors for apnoea"¹⁸.

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Stop Caries NOW for a Cavity-Free Future

- Did you know that in Australia:
- Dental caries is the most prevalent health problem
- Dental admissions are the highest cause of acute preventable hospital admissions²
- More than 60,000 Australians per year are hospitalised for preventable dental conditions. Over 26,000 are under 15 years who are given a general anaesthetic for dental fillings and extractions²

What more can you do to help prevent this disease?

You may be interested to read an article published in 2013 that summarises caries management pathways from around the world including CAMBRA, ICDAS and the Caries Management System developed by Assoc Professor Wendell Evans at Sydney University. The reference for this article is: Ismail et al., Community Dental and Oral Epidemiology, 41; e12-e40. Alternatively you may like to visit the Alliance for a Cavity Free Future website where you will find 10 webinars presented by cariology experts from around the world discussing these management pathways.

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Figure 3. (a) The obstructed airway in OSA. (b) Adenotonsillary hypertrophy. (c) Pierre Robin Sequence, an example of a craniofacial anomaly that is a severe risk factor for OSA in children.

Habits and muscular dysfunction

Oral habits such as thumb and finger sucking, tongue thrusting, lower lip entrapment and other aberrations are aetiological factors in development of Class II malocclusions. The earlier these are treated, the greater the potential to reduce the severity of the malocclusion that may develop. The prevention and correction of such dysfunctions, especially if severe, may be an indication for early treatment such as with functional appliances¹⁹.

Compliance

Compliance is an important determinant for successful early Class II treatment. Functional appliance and other orthodontic therapies are most efficacious in patients who show a willingness to comply²⁰. A literature review by King et al identified several studies that associated greater compliance rates with pre-adolescent patients²¹. However, this may not always be the case.

Why not treat A Class II early?

Minor Trauma

Despite evidence that the prevalence of dental trauma increases with increased overjet and lip incompetence in children⁸⁻¹⁰, other studies^{22,23} have found that early orthodontic treatment did not reduce the incidence of trauma significantly. Further, incisor trauma that occurred before or during treatment was minor and the cost-benefit ratio of early Class II treatment to primarily prevent trauma is unfavourable in some cases²².

Compliance and cost

There is always a risk of exhausting a patient's capacity to co-operate as two-phase treatment usually takes longer to complete and is associated with poor compliance during the second phase. A study by Hsieh²⁴ indicated a higher incidence of premature termination of treatment amongst patients who received early Class II treatment. Two-phase treatments are also more expensive for the family.

Later treatment is just as effective

Randomised controlled trials^{25,26} have been conducted to investigate the long-term effectiveness of early Class II treatment. They concluded that there is no long-term advantage of early treatment (first of two phases) over later, single-phase treatment. A Cochrane Review²⁷ supported this conclusion. Early treatment was found to not reduce the percentage of children who needed extractions during phase-2 treatment, nor did it affect patients' future requirement for orthognathic surgery²⁵. Class II treatment in the early permanent dentition has also been claimed²⁸ to be more efficient with a better outcome in a shorter time than treatment in the early or late mixed dentition. A Twin-block study²⁹ concluded that more favourable treatment effects were achieved slightly before or at the onset of the pubertal growth spurt, whilst Pancherz³⁰ does not recommend treatment with a Herbst appliance during the mixed dentition because cuspal interdigitation is difficult to achieve to prevent relapse.

Controversies

Problems with Randomised Controlled Trials (RCTs)

Caution must be exercised when interpreting the results and conclusions of a few well-known RCTs conducted on the treatment modalities for Class II^{14,31-34}. Darendeliler explains how the interpretation of the data may be misleading in the context of everyday clinical practice³⁵. Randomised controlled trials are the gold standard to investigate the effects of treatment, but only for specifically defined medical conditions. The published RCTs considered the Class II malocclusion as a specific condition. However, Class II is a combination of many dental and skeletal anomalies³⁶, and RCTs may use falsely specific selection criteria on their subjects (e.g. overjet equal to or greater than 7mm³² which can occur in other malocclusion, not only in Class II). The RCTs report the average results to conclude that neither early treatment of Class II nor functional appliances have a significant skeletal or dental benefit over other modalities. It is not clinically relevant to apply the average conclusion to all patients, because, a particular child may show a very good orthopaedic response that is clinically significant due to individual variation. This was found to happen in 25% of a group of consecutively treated patients selected by Darendeliler³⁵ from an Australian private practice according to the criteria of two RCTs^{32,33}. Further, in most RCTs, there was no consideration of the effects that early treatment has on patients' profiles, which is an important outcome measure when assessing the effectiveness of functional appliance treatment (Figure 4). This sheds further doubt on the relevance of such studies.



Figure 4. Patients gaining significant favourable skeletal, dental and soft tissue profile changes with functional appliance treatment in (a) the mixed dentition and (b) the permanent dentition. The final photos of the mixed dentition case were taken at the 12-month post-treatment review.



BRIGHTER FUTURES

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Can mandibular growth be changed?

The mode of action of functional appliances to correct Class II malocclusions, and their effect on mandibular growth is controversial. Animal studies^{37,38} have suggested that the mandible does not have a genetically predetermined length, and can be altered with prolonged treatment with functional appliances that posture the mandible forward. However, results from these animal studies cannot be directly extrapolated to humans as many of the experimental conditions used cannot practically and/or ethically be replicated for humans. Three possible effects that functional appliances can have on mandibular growth have been suggested (Figure 5). No clear evidence exists to report that either increased mandibular growth, beyond its genetic potential, or accelerated growth occurs in studied populations³⁹. The most likely possibility in humans is that functional appliances do not change normal growth and the mandible is simply positioned forward to "jump the bite", and subsequent normal mandibular growth at the condyle adapts to this position⁴⁰.

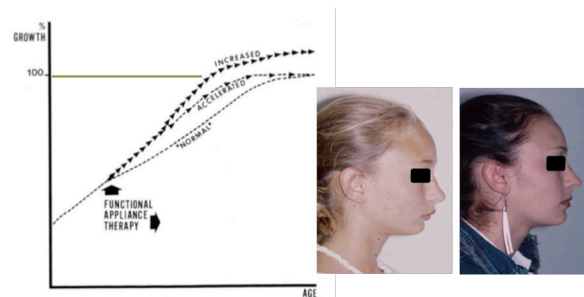


Figure 5. Three proposed possible effects of functional appliances on mandibular growth³⁹.

When should Class IIs be referred to the Orthodontist?

With respect to management of Class II malocclusions, children should be referred for orthodontic consultation around the age of 7 to 8 years, at the time of eruption of the permanent incisors. Before this stage, it is difficult to predict the particular characteristics and subgroup of Class II that will develop from the deciduous dentition⁴¹. In addition, once all the permanent incisors have erupted, treatment is usually more practical from a mechanical as well as diagnostic and behavioural point of view. At that age, or subsequently, young patients may or may not receive immediate Class II treatment as each individual case is diagnosed with the considerations discussed above in mind, tempered with reference to existing orthodontic literature⁴².

Conclusion

Class II malocclusions are common in the general population and manifest early during a child's development. In the absence of a particular habit, such malocclusions do not self-correct. The literature reflects the wide range of views regarding early (mixed dentition) treatment of Class II malocclusions and its efficacy. It is generally, but not universally, accepted that children with incompetent lips and an increased overjet greater than 7 to 8mm are at an increased risk of suffering trauma to their upper incisors. Some of these children will also suffer psychosocial issues as a result of their appearance. Reducing this overjet with early phase orthodontic and/or orthopaedic treatment at about 7 to 9 years of age will be beneficial and is indicated. There may also be some children with OSA who would benefit from early Class II correction, however this is still unclear. If no such specific indications for early treatment exist, the evidence is now clear that Class II correction should be delayed until about the early permanent dentition as the child is actively growing through their pubertal growth spurt. Treatment at that time appears to be more efficient, predictable, stable and cost effective.

As Baccetti⁴³ fittingly commented:

"... The astute clinician recognizes the possibilities of early treatment, yet chooses to intervene only in those instances in which the treatment will produce an obvious benefit to the patient within a defined time period and at a reasonable cost, financial, and otherwise."

References available on request