

Australian Society
of Orthodontists



University of Sydney



Early Orthodontic Treatment of Class III Malocclusions

Creating Brighter Futures

In 1899, Angle first described a Class III malocclusion as "the relation of the jaws is abnormal ... protrusion of the lower jaw, with mesial occlusion of the lower teeth; lower incisors and cuspids inclined lingually."¹



Figure 1: Class III malocclusion

Both genetic and environmental factors are considered to be involved in the development of Class III malocclusions. From a sample of 24 subjects with Class III malocclusions, one in three had a parent with a Class III malocclusion, while 13 out of 102 siblings also demonstrated the same trait. This high incidence of siblings with Class III malocclusion, at least three times the frequency of the general population, suggests a strong genetic influence, although only a polygenic mode of transmission could be inferred.² Environmental stimuli for excessive mandibular growth can arise from habits and mouth breathing that result in constant forward mandibular posturing,^{3,4} while imbalances in the development of muscular and skeletal structures in central and peripheral regions of the maxilla, due to functional and postural problems, can be responsible for insufficient development of the anterior midface and Class III dysmorphoses.⁵

In Caucasians, the incidence of Class III malocclusions has been found to be 1-4%⁶⁻⁸, while it is higher in Asian populations, ranging from 4-5% among Japanese and 4-14% among Chinese populations.^{9, 10}

Characteristics of Class III Malocclusion

A Class III malocclusion can exist in a variety of combinations of skeletal and dental components within the facial skeleton. The combination of maxillary retrusion and mandibular protrusion was found to be the most frequent combination of skeletal anomalies in North American adults with Class III malocclusion, while maxillary retrusion was more commonly found in juveniles and adolescents. The most consistent characteristics of Class III malocclusions include Angle's Class III molars and canines, proclined maxillary incisors and retroclined mandibular incisors with an edge-to-edge incisor relationship or anterior crossbite.¹¹

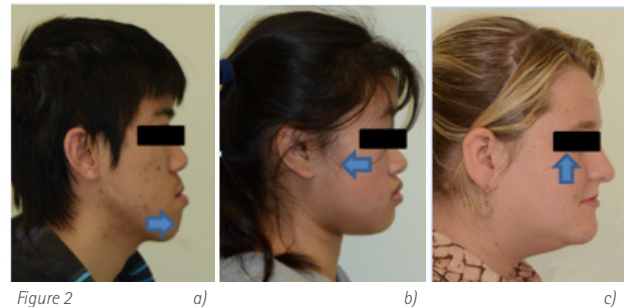


Figure 2: Class III Malocclusion produced by different skeletal patterns. The arrows indicate the skeletal abnormality responsible for the facial profile disharmony and malocclusion .a) mandibular prognathism, b) maxillary retrusion, c) maxillary vertical deficiency leading to counter-clockwise rotation of the mandible. Note how vertical facial dimension plays a role in affecting the antero-posterior relationship of the skeletal bases and profile.

Differential diagnosis of anterior crossbites

An anterior crossbite in the primary or mixed dentition may be due to the abnormal inclination of the maxillary and/or mandibular incisors, occlusal interferences (functional deviation), or skeletal discrepancies of the maxilla and/or mandible.¹² Differentiating between different types of anterior crossbite is important in understanding the severity of the malocclusion and determining the appropriate treatment plan including duration and timing of treatment, as well as providing appropriate advice to the parents and family. Assessment of the molar relationship, overjet, incisor inclination, profile and presence of a functional deviation is essential in differentiating between simple dental and more complex skeletal anterior crossbites.¹³

- A Class I Malocclusion with an anterior crossbite will feature a Class I molar relationship with no functional deviation and a well-balanced profile when the mandible is in centric relation.
- A Pseudo Class III malocclusion features an anterior crossbite/negative overjet, Class III molar relationship following a functional mandibular deviation anteriorly into centric occlusion, which on resolution results in a Class I molar relationship and a well-balanced profile when the mandible is in centric relation.

Colgate CARE COLUMN

The ADA Congress was a great event.
It was wonderful to see so many of you there.

Bright Smiles Bright Futures was re-launched to the profession at the conference with the new "Dr Rabbit and the Tooth Defenders" programme. This is a truly engaging new version of the much loved resource which is used in schools with a specially designed kit for you to use in the dental surgery or at community events. This resource is provided by Colgate to dental professionals in the interests of improving the oral health of children and is offered at no cost to practitioners.

We hope you were able to visit the Colgate stand at the Congress this year to see the new addition to the Colgate range of products. Pro-clinical is a new electric toothbrush with an impressive research base to support its unique mode of action. The 1500 series helps patients comply with professionally recommended brushing techniques and provides several clinically proven benefits for the improvement of oral health.

We hope you enjoyed the event and are fulfilled with new knowledge and tips for your practice.

COLGATE IS THE PREFERRED BRAND OF THE ASO NSW

You may wish to share this issue of Brighter Futures with your hygienists and other staff members.



- A True Skeletal Class III malocclusion with an anterior crossbite features a negative overjet, Class III molar relationship with no functional deviation and a straight/concave profile when the mandible is in centric relation.
- A Camouflaged Skeletal Class III malocclusion will feature a positive overjet, Class III molar relationship with no functional deviation, proclined upper incisors, retroclined lower incisors and a straight or concave profile.

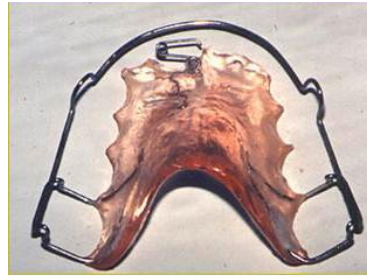


Figure 3: Upper removable appliance with z-spring for proclination of upper incisor. Courtesy of D Vickers.

Rationale for Early Timely Treatment of Class III Malocclusions

Patients receiving early orthodontic or orthopaedic treatment could require additional surgical correction following completion of skeletal growth.¹³ Given this consideration, the objectives of early timely treatment of Class III malocclusions include:¹⁴⁻¹⁶

- Prevention of progressive irreversible soft tissue, bone or dental changes: Incisal attrition and thinning of the lower incisor labial cortical plate and/or gingival recession can occur as a result of premature incisor contacts associated with anterior crossbites.
- Establishing a favourable environment for further growth and preventing development of skeletal discrepancies: Early treatment can be indicated to resolve functional deviations, soft tissue abnormalities and dentoalveolar anomalies responsible for adverse skeletal growth.
- Occlusal function: Timely treatment aimed at resolving functional shifts and anterior crossbites restores occlusal balance and reduces the risk of unfavourable adaptive condylar and mandibular growth patterns.
- Simplifying comprehensive Class III treatment in the permanent dentition: In mild and moderate Class III cases, early treatment to eliminate functional deviations, potential dentoalveolar compensations and facilitate development of proportional skeletal relationships can improve the potential for successful orthodontic camouflage treatment, avoiding the need for orthognathic surgery. In severe Class III cases, early correction of transverse discrepancies can reduce the complexity, extent and morbidity of later surgical procedures.
- Psychosocial development and well being during childhood: Restoration of normal skeletal proportions and occlusal balance improve lip posture, oral function and dento-facial aesthetics.¹⁷

As a general guide, early treatment of skeletal Class III malocclusions could be suitable for patients with the following characteristics: pubescent growth remaining, convergent facial type, anteroposterior functional deviation, symmetrical condyle growth, mild skeletal disharmony, good compliance, no familial mandibular prognathism and good facial aesthetics.¹⁸

Effective management of skeletal Class III malocclusions involves accurate identification and diagnosis of concomitant dental, transverse and vertical skeletal discrepancies, as well as a comprehensive assessment of the patient's growth rate and direction. Timing of early treatment is important for exploiting peak growth periods to optimise any orthopaedic effects from early treatment. Appropriate timing in conjunction with a comprehensive understanding by experienced clinicians of the interplay between the various components that contribute to an individual's Class III malocclusion determine effective early orthopaedic treatment options and regimes that fulfil the objectives of early treatment as well as minimise any undesirable side-effects.

Treatment Options for Dental Class III Malocclusions

Anterior crossbites of dental origin, are commonly corrected using a removable appliance with finger springs/screw mechanism or with partial fixed appliances. These are effective tools for the general practitioner faced with simple anterior crossbites, as seen in patients with a Class I malocclusion with an anterior crossbite or Pseudo-Class III malocclusions.

Treatment Options for Skeletal Class III Malocclusions

The Chin Cup appliance was a popular choice for managing Class III malocclusions resulting from mandibular prognathism. Although early treatment with Chin Cup therapy can produce favourable results, further research has found that further growth of the mandible following cessation of treatment can lead to relapse.¹⁹ Consequently, use of the Chin Cup appliance has declined.

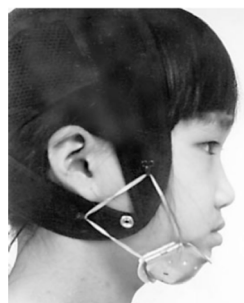


Figure 4: Chin Cup Appliance 20, 21

Protraction facemask, also known as Reverse Pull Headgear, can be used to treat Class III patients with a retrusive maxilla and a hypodivergent growth pattern.^{17, 22} Elastics stretch from the adjustable outer wire of the facemask to an intra-oral anchorage unit at the level of the maxillary canines.¹⁶ The intraoral anchorage can include an expansion appliance for correction of transverse

discrepancies. Optimal timing for early treatment is during the late primary or early mixed dentition when initial eruption of maxillary incisors will stabilise positive overjet and overbite by the end of treatment.¹⁷ Maxillary orthopaedic treatment is reported to be effective during the prepubertal stages of growth with supplemental growth of 2mm over controls.^{23, 24}

As there is commonly an extrusive or downward component of the force produced by extra-oral traction, great care and manipulation of the appliance design is required for patients with hyperdivergent facial patterns.

Class III Functional Appliances are viable options for dentoalveolar correction of mild and pseudo-Class III malocclusions with functional shifts. They are also used effectively as retainers following facemask therapy^{16, 25}.

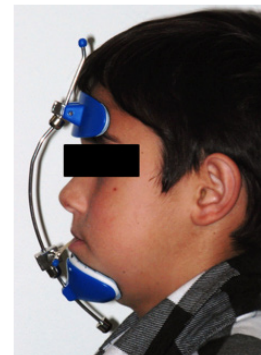


Figure 5: Facemask Appliance. Courtesy of S. Ma 2011

Prognosis of early treatment

In a randomised clinical trial, one third of diagnosed Class III retrusive maxilla patients treated with facemask therapy relapse to a reverse overjet towards the end of the growth period and require combined orthodontic/surgical correction due to unfavourable mandibular growth patterns.²⁶ The morphological pattern of mandibular excess is established early, before 7 years of age, and once established, the annual mandibular growth increment before, during and after puberty for Class III patients is similar to those with a normal or Class I facial pattern.²⁷⁻³⁰ A longer period of active mandibular growth and the absence of catch-up maxillary growth can deteriorate the Class III sagittal skeletal discrepancy.

Following early treatment of Class III malocclusions, follow-up lateral cephalograms can be superimposed on post-treatment

BRIGHTER FUTURES

is published by the Australian Society of Orthodontists (NSW Branch) Inc. in conjunction with the Orthodontic Discipline at the University of Sydney.

The newsletter is intended to help keep the dental profession updated about contemporary orthodontics, and also to help foster co-operation within the dental team.

Without the generous support of Henry Schein Halas and Colgate, who are an integral part of the dental team, this publication would not be possible.

The statements made and opinions expressed in this publication are those of the authors and are not official policy of, and do not imply endorsement by, the ASO (NSW Branch) Inc or the Sponsors.

Correspondence is welcome and should be sent to:

Department of Orthodontics
University of Sydney
Sydney Dental Hospital
2 Chalmers Street,
Surry Hills NSW 2010

AUTHOR & EDITORS

Dr Carolyn Ng
PRINCIPAL AUTHOR

Dr Chrys Antoniou
Dr Dan Vickers
Prof M Ali Darendeliler
Dr Michael Dineen
Dr Ross Adams
Dr Susan Cartwright
Dr Vas Srinivasan

www.aso.org.au

films to determine the sagittal growth changes of the maxilla and mandible. Assessment of sagittal maxillary and mandibular growth changes can determine whether future camouflage treatment or surgical correction is indicated.^{13, 16} In almost all cases where early treatment is prescribed for Class III malocclusions, the patient and parents must be informed that further treatment could be indicated including the option of orthognathic surgery.

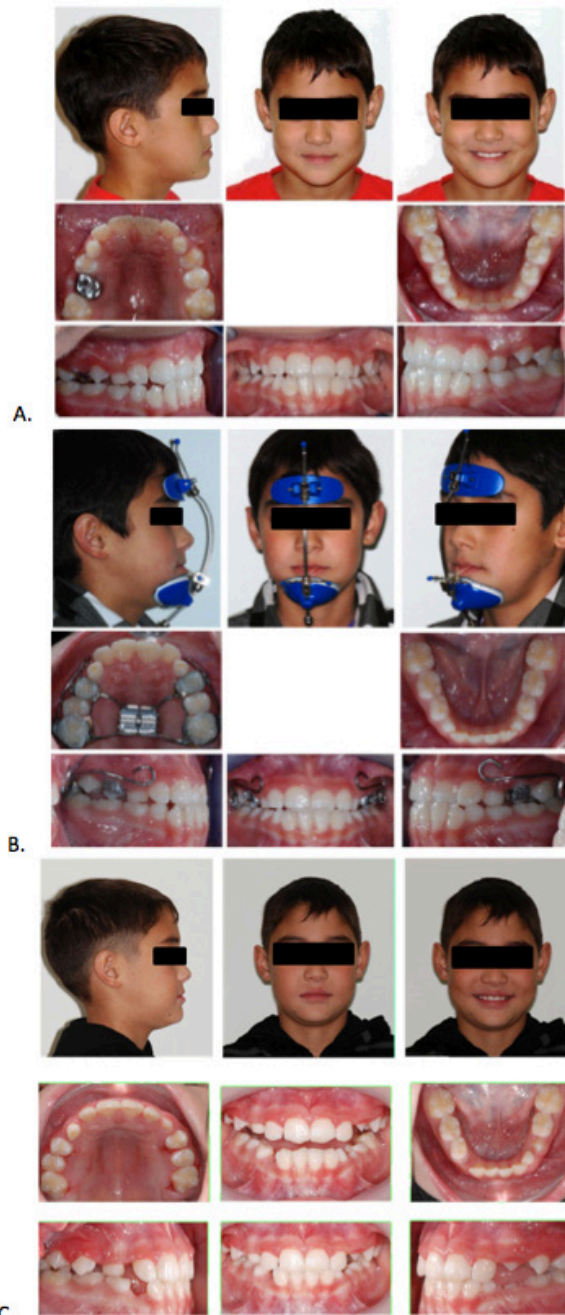


Figure 6 A. Pre-Treatment, B. Reverse-Pull Headgear Treatment with Rapid Maxillary Expansion, C. Post-treatment.
Courtesy of S. Ma 2011

Conclusion

Although appropriate orthopaedic intervention in growing Class III individuals can be justified to obtain favourable maxillary growth, elimination of functional shifts and improvement of facial profile and self-esteem, clinicians must also consider the effect of prolonged mandibular growth in terms of the duration of retention, and the time frame for the evaluation of treatment stability.³¹

References available upon request