

# Paediatric Orthodontics

## Part 4: SEC III protocol in Class III malocclusion

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### Abstract

#### SEC III protocol: Early treatment of dentoskeletal Class III malocclusions

The early treatment of dentoskeletal Class III malocclusion is one of the more challenging situations for orthodontists, mainly for the uncertainty of stable long-term results due to the interaction of both environmental and genetic aetiological factors. Several interceptive protocols have been proposed during the past decades. The SEC III protocol includes two occlusal acrylic Splints combined with Class III elastics and chin cup. The protocol was proposed to facilitate Class III dentoskeletal correction by eliminating the intercuspatation and the tongue thrust with clockwise mandibular rotation and minimal dentoalveolar compensation. The main difference with all the other appliances is the vertical control, which is crucial in difficult cases such as hyperdivergent Class III malocclusions.

**KEYWORDS** Class III malocclusion, Early treatment, SEC III protocol.

### Introduction

Dentoskeletal Class III malocclusions are extremely challenging, mainly for the uncertainty of stable long-term results. The aetiology of Class III malocclusion is multifactorial with interaction of both environmental and genetic aetiological factors [Cevidane et al., 2010; Hartsfield et al., 2017; Perillo et al., 2015]. The incidence in the Caucasian population is low, between 1% and 5%; however, in the Asian populations it is higher, with a percentage varying from 9% to 19% [De Toffol et al., 2008; Perillo et al., 2013]. Currently, there are many treatment options for Class III malocclusions ranging from an interceptive treatment starting during childhood to treatments in permanent dentition with fixed appliances eventually associated with extractions and/or auxiliaries or an orthognathic surgery in

adulthood [Jamilian et al., 2016; Ferro et al., 2003; Ferro et al., 2016; Perillo et al., 2016].

However, the early treatment approach of children with Class III malocclusion is suggested for several remarkable functional and aesthetical reasons, although aware of the uncertainty of the long-term results [Cordasco et al., 2014; Quinzi et al., 2018a, Paglia, 2019; Perillo et al. 2010]. Early treatment can help to promote a more favourable skeletal balance to avoid a possible worsening of the malocclusion during growth [Piancino et al., 2019; Raucci et al., 2015b]. Some of these reasons are the correction of the negative overjet, the elimination of any deflecting contact, enhancing the maxillary growth and limiting the mandibular one, the control and/or elimination of the environmental factors, i.e. an incorrect tongue position and function, and the minimisation of incisor compensation [Raucci et al., 2015b; Quinzi et al., 2018b, Grassia et al., 2015; Perillo et al., 2015]. Moreover, early treatment may also help these children to avoid psychological problems, increasing both their self-confidence and self-esteem. Thus, the treatment of growing patients with Class III malocclusion may reduce the length of the orthodontic treatment phase in permanent dentition and, even in case of failure, can lead to less invasive orthognathic surgical treatments at the end of the growth [Rosa et al., 2019; Quinzi et al., 2019; De Toffol et al., 2008].

Over the years, many interceptive treatments for Class III patients have been presented, although most of them aim to correct the dentoskeletal Class III malocclusion not only through sagittal skeletal changes associated with some dental compensation, but also with a compensative clockwise mandibular rotation. However the literature is scarce of long-term outcomes for many of the proposed options [Chatzoudi et al., 2014; Gazzani et al., 2018; Jamilian et al., 2016; Maspero et al., 2012; Perillo et al., 2016].

The purpose of this paper is to describe a valid orthopaedic approach, named SEC III protocol, in which the main difference with the other appliances is the vertical control, crucial in the most difficult cases such as the hyperdivergent Class III malocclusions [Ferro et al., 2003; Perillo et al., 2015].

### SEC III protocol

The SEC III protocol entails two occlusal splints with Class III elastics and chin cup (Fig. 1). The objective is to facilitate

the correction of the dentoskeletal Class III malocclusion on the sagittal plane, avoiding the clockwise mandibular rotation and minimising incisor compensation.

The two removable acrylic splints cover both the occlusal surface and the buccal and lingual ones. The splints are smooth to avoid any discomfort to the patient and to freely sliding one over the other at the occlusal plane, facilitating the sagittal Class III correction. Moreover, the splints help to eliminate, or at least control, Class III worsening factors such as the anterior interposition and the lower position of the tongue, and the deflecting contacts.

Four buccal hooks, two in the upper and two in the lower arch, are symmetrically located on each side of the splints, distally to the maxillary last molars and between the mandibular canines and lateral incisors.

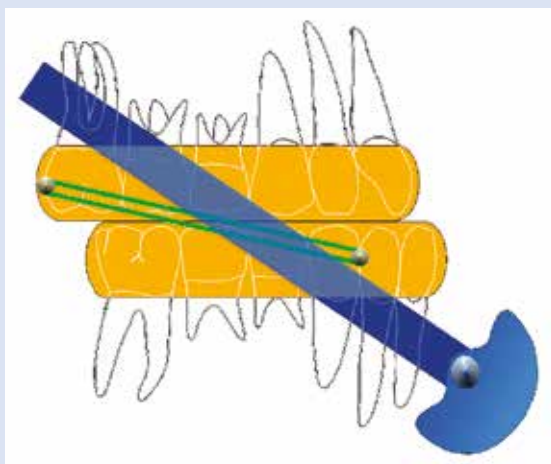


FIG. 1 SEC III protocol

The patients is asked to apply on these hooks the Class III elastics with a force ranging from 5 to 25 ounces (between 150 and 750 grams) per side. Force levels are chosen by the orthodontist depending on the splint stability. Patients are instructed to wear them for a minimum of 16 hours per day and to change them at least twice a week. These elastics allow a forward movement of the maxilla along with the upper arch, and a posterior movement of the mandible with the lower arch.

The side effect is the extrusion of the upper molars with a following clockwise mandibular rotation. To avoid this, the chin cup is applied with the force vector passing through the first upper molars.

The chin cup is regulated to develop a force ranging from 16 to 32 ounces (between 500 and 800 grams) per side (Fig. 1), and the patient is required to wear it at least 14 hours per day. However, the magnitude of the force is always related to the individual tolerance. Temporary side effects, such as local alopecia and redness or inflammation of the skin around the chin may be accounted, thus the patient's parents should be aware of these possible side effects. The SEC III active phase lasts until a positive overjet (2–3 mm) is reached. On average, about 1 year of SEC III protocol is needed. However, time differences are mainly related to the patient's age, compliance, and severity of the dentoskeletal problems [Perillo et al., 2015].

At the end of the active phase, if needed, patients receive supplemental treatment with conventional orthodontic appliances, as rapid maxillary expander, lingual grid, transpalatal bar [Raucci et al., 2015a], useful to solve other occlusal problems in each different case.

During the waiting period for complete transition, patients are asked to wear the chin cup only at bedtime with the aim of maintaining and stabilising the occlusal sagittal correction



FIG. 2 Sequence of a case treated with the SEC III protocol; the initial checkup.

achieved during the active phase and, above all, to control the mandibular growth. Thus, the chin cup vector has to pass through the condyle delivering a force ranging from 16 to 32 ounces (between 500 and 800 g) per side.

This protocol allows a sagittal dentoskeletal Class III correction associated with a minimum dentoalveolar

compensation and with a good vertical control without clockwise mandibular rotation.

A case treated with the SEC III protocol, followed by fixed appliances is presented (Fig. 2, 3, 4, 5). The outcomes of the SEC III protocol were mainly stable at the end of the growth and the final result is outstanding [Ferro et al., 2003].



FIG. 3 Sequence of a case treated with the SEC III protocol; the re-evaluation after SEC III treatment.



FIG. 4 Sequence of a case treated with the SEC III protocol; final checkup after multibracket fixed appliance.



FIG. 5 Sequence of a case treated with the SEC III protocol; long term checkup after 2-year retention.

### Modified SEC III protocol

A few patients treated with SEC III protocol can sometimes show a relapse that is mainly due to a hyperdivergent growth pattern. Thus, a modified SEC III protocol has been proposed, which aims to achieve a greater vertical control during the growth (Fig. 6).

The upper splint is trimmed from the first upper molar to molar to create a wedge effect with a single contact point on the last molars. This wedge effect is stressed adding to the lateral Class III elastics, an anterior elastic with a force ranging from 8 to 15 ounces (between 250 and 500 g), placed on three hooks: two located in the upper arch, between the cuspids and the lateral incisors, and one positioned in the lower arch on the midline.

This modified SEC III protocol allows a greater intrusion of the posterior teeth, associated with an increased counterclockwise mandibular rotation and a deeper overbite, goals useful, above all, in patients with a vertical growth pattern. Moreover, it is possible to insert an expansion screw in the upper splint to correct a dentoskeletal crossbite, often present in patients with a hyperdivergent dentoskeletal Class III malocclusion [Grassia et al., 2014]. In these cases, the upper splint has to be bonded on the upper arch (Fig. 7) from the deciduous canines to the second deciduous molars or the first permanent molars, when erupted. Patients are instructed to wear the lower splint, the elastics and the chin cup always with a force vector through the first upper molars, for about 1 year. Afterward, even in this modified SEC III protocol, the upper bonded splint may be eventually substituted with other

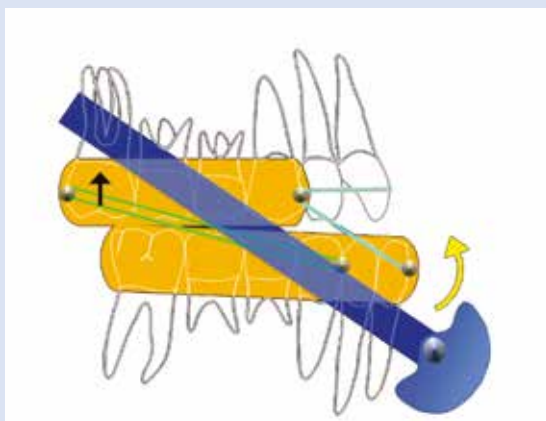


FIG. 6 Modified SEC III protocol.

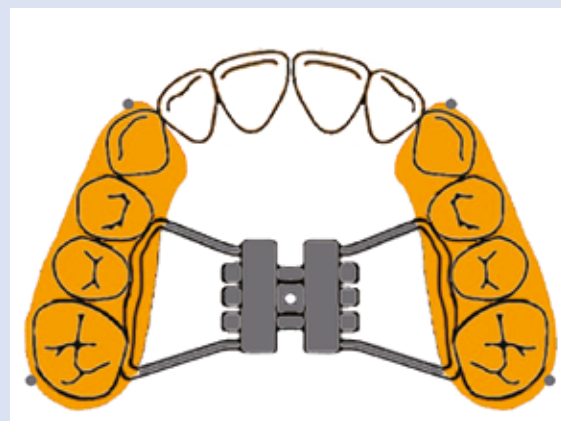


FIG. 7 Bonded upper splint with an expansion screw.

needed intraoral appliances during the transition period, wearing the chin cup only at bedtime with a force vector passing through the condyle for a better control of the mandibular growth.

## Conclusion

The early treatment is the gold standard for growing patients with a dentoskeletal Class III malocclusion. The several orthopaedic treatments available, including SEC III and modified SEC III protocols, allow to achieve a sagittal dentoskeletal correction with some degree of incisor compensation. However, the key point of the SEC III protocols is the better vertical control during the growth with no clockwise mandibular rotation, and also crossbite correction when needed.

## Conflicts of interest

There are no conflicts of interest.

## Declaration of patient consent

The authors certify that the patient's parents have given their consent for publication.

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