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Third Class Resolver: a retrospective analysis

ABSTRACT

Aim *To evaluate the use of Third Class Resolver (TCR©), a new fixed and functional orthopaedic appliance for the treatment of skeletal Class III malocclusion in adolescents and young adults.*

Materials and methods *Study Design: Retrospective analysis. Twenty subjects, 10 females and 10 males, affected by Class III malocclusion were treated with a new fixed orthopaedic appliance: the Third Class Resolver (TCR©). The mean age was 7 years at the beginning of treatment and 9 years at the end of treatment. The mean treatment time was 6 months. Digital cephalometric superimpositions on lateral radiographs taken at the start and end of treatment were assessed. The cephalometric values were statistically analysed.*

Results *Cephalometric analysis of changes during treatment shows a statistically significant increase of ANB angle (mean 1°) (P=0.045); increase of Witts Index (mean 3.5 mm) (P=0.003); decrease of Maxillo-Mandibular angle (MM) (mean -2.3°) (P=0.047); increase of Upper incisor-Maxilla Plane angle (angle mean 10.5°) (P=0.02); increase of the distance between Upper Incisor and A-Pg line (mean 2.4 mm) (P=0.021); increase of the mandibular branch length (mean 4.8 mm) (P=0.004).*

Conclusions *TCR© can be used fully for treatment of Class III malocclusions.*

Keywords *Fixed rigid orthodontic appliances; Functional orthodontics; Orthopaedic appliances; Third Class Resolver (TCR©).*

Introduction

The developing skeletal Class III malocclusion is one of the most challenging problems confronting the orthodontist. A large number of removable and fixed orthopaedic appliances are available for the treatment of this malocclusion in adolescents and young adults. Turpin and Graber states that interceptive treatment can prevent worsening of III Class malocclusion, later need for surgery and psychosocial problems [Turpin, 1981; Graber, 1966].

Since Class III is mostly due to maxilla hypoplasia, maxilla protraction is considered the first-line treatment [Baccetti et al., 1998; Jäger et al, 2001; Kapust et al., 1998; Zicari et al., 2009; Nartallo-Turley and Turley, 1998; Saadia and Torres, 2000]. According to literature, the ideal timing of Class III treatment is 5-9 years of age, so as to promote maxilla protrusion before the closure of circummaxillary sutures; the types of devices used more frequently for the early treatment are mainly functional (Fränkel III, BIONATOR III) and orthopaedic (Delaire, Grummons and Petit mask, Chin cup, SEC III) [Baccetti et al., 1998; Baccetti et al., 2000; Chen et al., 2012; Ferro et al., 2003; Grummons 1994; Hegmann and Ruther, 2003; Jäger et al, 2001; Kapust et al., 1998; Karthi et al., 2013; Merwin et al., 1997; Nartallo-Turley and Turley, 1998; Nganet al. 1996; Petit, 1983; Saadia and Torres, 2000; Uçem et al.2004; Westwood et al. 2003; Yuksel et al., 2001].

Cephalometric findings after treatment of Class III malocclusion with both functional and orthopaedic appliances indicate: maxillary advancement (A point); increase of anterior and posterior maxillary arch width; mandibular clockwise rotation; increase of facial height; proinclination of upper incisors and retroinclination of lower incisors, bite opening; correction of facial concavity, [Baccetti et al., 1998; Baccetti et al., 2000; Ferro et al., 2003; Grummons 1994; Halicioglu et al, 2014; Hegmann and Ruther, 2003; Jäger et al, 2001; Kapust et al., 1998; Merwin et al., 1997; Nartallo-Turley and Turley, 1998; Nganet al. 1996; Petit, 1983; Saadia and Torres, 2000; Uçem et al.2004; Westwood et al. 2003; Yuksel et al., 2001].

The aim of this study was to investigate the efficacy of the Third Class Resolver (TCR©), a new cunctional appliance for non-compliance treatment of Class III in adolescents and young adults, in order to minimize the side effects of the Class III treatment with orthopaedic appliances.

Material and methods

Twenty subjects, 10 males and ten females, mean age 7 years at the beginning of treatment and 9 years at the end of treatment, with a Class III malocclusion were included in this study. Third Class Resolver (TCR©) (Fig. 1) (Dental World, Molfetta, Italy) was applied for the

FIG. 1 The TCR© appliance.

treatment of Class III malocclusion.

The mean time of treatment was 6 months. Standardised lateral cephalometric radiographs were used to evaluate all morphological and structural changes. Cephalometric variations were assessedthrough Enlow and Steiner analyses, with relative initial and final superimpositions.

Cephalometric values were statistically analysed before and after treatment. Wilcoxon Signed Rank Test was applied and $P < 0.05$ was assumed as reference threshold for the statistical significance of the test.

Results

The results before (T0) and after treatment (T1) are show in Table 1. Cephalometric analysis of changes during treatment shows a statistically significant increase of ANB angle (mean 1°) (P=0.045); increase of Witts Index (mean 3.5 mm) (P=0.003); decrease of Maxillo-Mandibular angle (MM) (mean -2.3°) (P=0.047); increase of Upper incisor-Maxilla Plane angle (angle mean 10.5°) (P=0.02); increase of the distance between Upper Incisor and A-Pg line (mean 2.4 mm) (P=0.021); increase of the mandibular branch length (mean 4.8 mm) (P=0.004).

Although no statistically significant or clinically relevant evidences were found, we recorded reduction of SNA angle (mean 1.3°), reduction of nose-labial angle (mean -1.5°), increase of the angle between the upper incisor and the Frankfurt plane (mean 6.2°), decrease of the Upper Goniac angle (mean -1.8°), increase of mandibular body (mean 3.3 mm).

Value	Mean range	T0 (μ)	T1 (μ)	Statistical significance
SNA angle (°)	82 ± 2	78,0	79,3	
SNB angle (°)	80 ± 2	75,7	76,0	
ANB angle (°)	2 ± 2	2,3	3,3	*
WITTS INDEX (mm)	0 ± 2	-2,1	1,6	*
GoGnSN angle (°)	32 ± 5	36,5	37,7	
MM (°)	28 ± 6	29,3	27,0	*
FMA (°)	25 ± 3	24,5	25,0	
Mand. Corpus lenght (mm)		57,1	60,4	
Mand. Ramus height (mm)		43,8	48,6	*
Upper Incisor-Bispinal Plane (°)	110± 2	105,2	115,7	*
Upper Incisor- FHP (°)	110± 1	107,9	116,1	
Upper incisor-SN (°)	103 ± 2	95,9	105,4	
Upper incisor- A-Pg line (mm)	3,5 ± 2	3,5	5,9	*
IMPA (°)	90 ± 5	94,3	94,4	
Gonial angle (°)	120 ± 5	137,3	135,3	
Upper gonial angle (°)	50 ± 2	58,2	55,6	
Lower Gonial angle(°)	70 ± 3	79,1	79,7	

TAB. 1 Cephalometric values before and after treatment with TCR©.

Discussion

Changes in maxillary and mandibular skeletal components

There was a statistically significant increase of ANB angle (mean 1°) (P=0.045) and of Witts Index (mean 3.5 mm) (P=0.003); demonstrating a marked improvement of the maxillomandibular relationship.

This result, as effect of Class III therapy, agrees with the literature [Anne Mandall N et al., 2012; Baccetti et al., 1998; Baccetti et al., 2000; Ferro et al., 2003; Gencer D et al., 2014; Grummons 1994; Hegmann and Ruther, 2003; Jäger et al, 2001; Kapust et al., 1998; Merwin et al., 1997; Nartallo-Turley and Turley, 1998; Nganet al. 1996; Petit, 1983; Saadia and Torres, 2000; Uçem et al.2004; Westwood et al. 2003; Yuksel et al., 2001]. Moreover, increase of the mandibular body (mean 3.3 mm), although not statistically significant, demonstrates that the TCR© does not limit the

mandibular growth nor induce a backward position of it, reducing the risk of TMJ damages.

Vertical component

It must be stressed that there was a statistically significant reduction of the maxillo-mandibular angle (MM) (mean -2.3°) (P=0.047), which demonstrates a control of the low vertical dimension. This result is extremely relevant if we consider the role of the vertical pattern in growing subject affected by Class III and the tendency of functional appliances to increase facial height [Baccetti et al., 1998; Baccetti et al., 2000; Ferro et al., 2003; Grummons 1994; Hegmann and Ruther, 2003; Jäger et al, 2001; Kapust et al., 1998; Merwin et al., 1997; Nartallo-Turley and Turley, 1998; Nganet al. 1996; Petit, 1983; Saadia and Torres, 2000; Uçem et al.2004; Westwood et al. 2003; Yuksel et al., 2001]. Although not statistically significant, a reduction of the Upper Goniac angle was observed (mean -1.8°). The analysis of this finding underlines that the TCR© can work well on vertical dimension; this phenomenon can be explained considering the action of the masseter muscle. Consequentially, it is possible, through the muscular activity, to control facial height allowing a counter-clockwise rotation of the mandible, as confirmed by the increase of the mandibular branch length (mean 4.8 mm) (P=0.004).

Maxillomandibular dentoalveolar components

According to the majority of the outcomes reported in literature [Baccetti et al., 1998; Baccetti et al., 2000; Canturk BH et al., 2014; Ferro et al., 2003; Grummons 1994; Hegmann and Ruther, 2003; Jäger et al, 2001; Kapust et al., 1998; Merwin et al., 1997; Nartallo-Turley and Turley, 1998; Nganet al. 1996; Petit, 1983; Saadia and Torres, 2000; Uçem et al.2004; Westwood et al. 2003; Yuksel et al., 2001] statistically significant changes of the upper incisor position were observed due to the treatment. An increase of the upper incisor-maxilla plane angle (angle mean 10.5°) (P=0.02) and of the distance between upper incisor and A-Pg line (mean 2.4 mm) (P=0.021) were observed, as inevitable dental effects of the stimulus to promote the advancement of the maxilla.

Conclusion

The TCR© exerts its action without patient compliance, safeguarding aesthetics, allowing lateral excursions and good oral hygiene. It is resistant to fracture and promotes optimal direction of forceand of proprioceptive contact. It has a modular activation, easy intraoral adaptation and there is the possibility to associate it with other components and orthodontic appliances.

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