M. D'Attilio, D. Rodolfino, A. Filippakos,
M. Saccucci*, F. Festa, D. Tripodi

Department of Oral Science, Nano and Biotechnologies,
G. D'Annunzio, University of Chieti- Pescara, Chieti, Italy
**Department of Oral and Maxillofacial Science*
Sapienza University of Rome

e-mail: tripodi@unich.it

Second Class Resolver: a retrospective analysis

ABSTRACT

Aim *To evaluate the use of Second Class Resolver (SCR©), a new fixed orthopaedic appliance, for the treatment of skeletal Class II malocclusion in growing subjects.*
Subjects and Method *Design Retrospective analysis. Forty subjects were treated with Second Class Resolver (SCR©). The mean age was 8 years at the beginning of treatment and 10 years at the end of treatment. Digital cephalometric superimpositions on lateral radiographs taken at start and end of treatment were assessed. The cephalometric values were statistically analysed.*
Results *Cephalometric analysis of changes during treatment shows reduction of ANB angle (mean 2°); reduction of Witts Index (mean 3 mm); reduction of Maxillo-Mandibular angle (MM) (mean 1°); reduction of SNA (angle mean 3°); reduction of gonial angle (mean 1.8°); increase of the mandibular branch length (mean 5 mm); increase of mandibular body (mean 2.9°).*
Conclusion *The Second Class Resolver© can be beneficially used for the treatment of Class II malocclusion.*

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

Introduction

The developmental skeletal Class II malocclusion is one of the most challenging problems confronting orthodontic practitioners. In a growing patient, an optimal aesthetic result would ideally be obtained by using an orthopaedic appliance to accelerate the development of the mandible by acceleration of growth at the condyles and bone apposition in the condylar fossae. This orthopaedic phase is generally followed by a separate stage of fixed appliance therapy to align teeth and establish optimal occlusion [Bass, 2006]. A large number of removable and fixed orthopaedic appliances are available for the treatment of skeletal Class II malocclusion in adolescents and young adults. Removable orthodontic appliances, heavily dependent on patient compliance, are mostly indicated in mixed and early adult dentition at the time of the pubertal growth spurt [Sander, 1998; Vardimon et al., 1990]. On the other hand, fixed appliances, rigid and semi-elastic, are permanently effective. The semi-elastic bimaxillary fixed appliances are capable of achieving mainly a dentoalveolar correction. In contrast, rigid appliances have proven useful in achieving a more extensive skeletal effect, mainly due to the adaptive osseous remodelling processes in the temporomandibular joint related to the therapeutic repositioning of the mandible [Cash, 1991; Crismani, 1998; Crismani, 1999; Weiland and Bantleon, 1995].

In literature, the cephalometric findings after treatment of Class II malocclusion with orthopaedic appliances (Herbst, activator, Frankel II, high-pull headgear) indicate: increase in mandibular length and in lower facial height, retroinclination of upper incisors and proinclination of lower incisors, correction of facial convexity, increase in lower anteroposterior and lower vertical soft tissue dimensions [Cozza et al., 2004; Marşan, 2007; McNamara et al., 1990; Nedeljković et al., 2010].

Analysis of a case series is used to investigate the efficacy of the Second Class Resolver (SCR©) for non-compliance sagittal mandible repositioning in growing subjects, devised to minimise the side effects of the Class II malocclusion treatment with orthopaedic appliances.

Materials and methods

Forty subjects (enrolled at the dental clinic of the University of Chieti), mean age 8 years at the beginning of treatment and 10 years at the end of treatment, with a Class II malocclusion were included in this series. The Second Class Resolver (SCR©) (Fig. 1) (Dental Word, Molfetta BA, Italy) was applied for the treatment of Class II malocclusion. The mean time of treatment was 6 months. Standardised lateral cephalograms were used to evaluate all morphological and structural changes. Cephalometric variations were carried out through Enlow and Steiner analyses, with relative initial and final superimpositions.

Results

Cephalometric values were statistically analysed before

FIG. 1 SCR©.

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.

The results before (T_0) and after treatment (T_1) are shown in Table 1.

Statistically significant differences: reduction of ANB angle (mean 2°); reduction of Witts Index (mean 3 mm); reduction of maxillomandibular angle (MM) (mean 1°); reduction of SNA (mean 3°); reduction of gonial angle (mean 1.8°); increase of the mandibular branch length (mean 5 mm); increase of mandibular body (mean 2.9 mm).

Although no statistically significant, clinical relevant evidences were found: reduction of the angle between the upper incisor and the bispinal plane (mean 0.5°); reduction of the angle between the upper incisor and the Frankfurt plane (mean 2°); reduction of the angle between the upper incisor and the SN plane (mean 1.8°); increase of IMPA (mean 0.8°).

Discussion

Changes in maxillary skeletal components

There was a statistically significant reduction of SNA angle (mean 3°); this result is in agreement with those of Pfeiffer and Grobèty, Righellis, Tsamtsouris and Vedrenne, Derringer, Jakobsson and Paulin [cited by Almeida et al., 2004], who noted that Class II malocclusion treatment with activators, extraoral traction, and Fränkel appliance have a restrictive effect on maxillary growth [Almeida et al., 2004].

Changes in mandibular skeletal components

There was a statistically significant change in any of the three variables used to evaluate mandibular growth, SNB angle (+ mean 0,6°), mandibular branch (+ mean 5 mm) and mandibular body length (+ mean 2,9 mm). These differences were not only statistically but also clinically significant. This finding of increased mandibular growth after orthopaedic appliance treatment is in agreement with the results of several investigations involving different appliances like activators, extraoral traction, Fränkel, Herbst, and Jasper Jumper appliances [Almeida et al., 2004; Bass, 2006; Cash, 1991; Cozza et al., 2004; Crismani, 1998 ; Crismani, 1999; Marşan, 2007; McNamara et al., 1990; Nedeljković et al., 2010; Sander, 1998; Vardimon et al., 1990; Weiland and Bantleon, 1995].

Changes in maxillomandibular skeletal relationship

The maxillomandibular relationship assessed by the ANB angle and Witts index showed marked improvement resulted from small changes in maxillary anterior growth and relevant increase in mandibular development.

VALUE	MEAN RANGE	T_0 (μ)	T_1 (μ)	STATISTICAL SIGNIFICANCE	N
SNA angle (°)	82 ± 2	82.6	80.1	*	226
SNB angle (°)	80 ± 2	76.6	76.1	*	227
ANB angle (°)	2 ± 2	6.0	4.0	*	227
WITTS INDEX (mm)	0 ± 2	3.4	1.6	*	227
GoGnSN angle (°)	32 ± 5	30.1	30.4		226
MM (°)	28 ± 6	26.0	25.0	*	225
FMA (°)	25 ± 3	21.2	21.2		225
Mand. Corpus lenght (mm)		48.6	51.7	*	226
Mand. Ramus height (mm)		40.2	45.2	*	224
Upper Incisor- Bispinal Plane (°)	110± 2	111.7	111.2		224
Upper Incisor- FHP (°)	110± 1	114.3	112.3		224
Upper incisor-SN (°)	103 ± 2	105.6	103.4		228
IMPA (°)	90 ± 5	101.6	102.4		228
Gonial angle (°)	120 ± 5	131.4	129.6	*	224
Upper gonial angle (°)	50 ± 2	57.8	55.6	*	224
Lower Gonial angle(°)	70 ± 3	73.5	74.0	*	224

TABLE 1 Cephalometric values before and after treatment with SCR©.

Vertical component

It should be stressed that there was a statistically significant reduction in the gonial angle (mean 1, 8°) resulted from a prevalent decrease of upper gonial angle. Moreover a decrease of maxillomandibular angle (MM) (mean 1°) was observed. This result is probably related to the action of the masseter muscle, whose rest dimension is changed by SCR©. It is possible to suppose that the fibres of the deep masseter, thanks to the vertical work direction of SCR©, predominate over the action of the superficial masseter. Consequentially, it is possible, through the muscular activity, to reduce the facial height allowing a counterclockwise rotation of the mandible.

Maxillomandibular dentoalveolar components

In disagreement with the majority of the outcomes found in literature [Almeida et al., 2004; Bass, 2006; Cash, 1991; Cozza et al., 2004; Crismani, 1998 ; Crismani, 1999; Marşan, 2007; McNamara et al., 1990; Nedeljković et al., 2010; Sander, 1998; Vardimon et al., 1990; Weiland and Bantleon, 1995], no statistically significant changes of the upper and lower incisor were observed caused by the treatment. This finding is probably related to the ability of SCR© to dissipate the unwanted reaction forces on the appliance rather than on dental elements of anchorage. Dental effects were observed, although no statistically significant, such as: reduction of the angle between the upper incisor and the bispinal plane (mean 0.5°); reduction of the angle between the upper incisor and the Frankfurt plane (mean 2°); reduction of the angle between the upper incisor and the SN plane (mean 1.8°); increase of IMPA (mean 0.8°).

Conclusions

It can be concluded that the effects produced by the Second Class Resolver (SCR©) are the following.

1. Mandibular advancement in both growing and adult patients, through an active and calibrated guidance of the mandible into a more anterior position.
2. Resolution of mandibular deviation through asymmetric activation.
3. Rapid resolution of skeletal and dental Class II without patients compliance, by a prolonged action over 24 hours able to change the behavioural patterns of the oral cavity's structures and consequently the neuromuscular pattern.
4. Respect of the oral function due to minimum interference with speech and swallowing, safeguarding of eccentric mandibular movements.
5. Control of vertical facial height in hyperdivergent patients and normalisation of divergence in brachyfacial subjects.
6. Concomitant use of fixed orthodontic appliances.
7. Control of undesired effects on teeth of Class II therapy with orthopaedic appliances, especially retroinclination of upper incisors and proinclination of lower incisors.
8. Harmonisation of soft tissues, with increased projection of lower lip, straightening of convex profile, reduction of mental-labial sulcus.

References

- Bass NM. The Dynamax System: A new orthopaedic appliance and case report. Journal of Orthodontics.2006; 2: 78-89.
- Bishara S E, Cummins D M, Jakobsen J R, Zaher A R 1995 Dentofacial and soft tissue changes in Class II, division 1 cases treated with and without extractions. American Journal of Orthodontics and Dentofacial Orthopedics 107: 28–37.
- Cash RG. Adult non extraction treatment with a Jasper Jumper. J Clin Orthod 1991;25:43–47.
- Casutt C, Pancherz H, Gawora M, Ruf S. Succes rate and efficiency of activator treatment. European Journal of Orthodontics. 2007; 29:614–621.
- Cozza P, De Toffol L, Colagrossi S. Dentoskeletal effects and facial profile changes during activator therapy. Eur J Orthod. 2004;26:293-302.
- Crismani AG, Freudenthaler JW, Köle EG. Die Behandlung einer Kl II/1-Malokklusion unter Verwendung der Eureka-Feder – ein Fallbericht. Inf Orthod Kieferorthop 1999;31:245–252.
- Crismani AG, Freudenthaler JW, Tripolt H, et al. Ausmaß und Konstanz der Kraftabgabe intermaxillärer Kraftquellen: Jasper Jumper, Williams Jumper, Kl II Gummizüge. Inf Orthod Kieferorthop 1998;30:451–458.
- D'Attilio M, Comparelli U, Festa F. Ortodonzia funzionale: equilibrio tra engramma neuromuscolare, forma e funzione. Edi-Ermes, 2011.
- Dolce C, Babb L, McGorray S, Taylor M, King GJ, Wheeler TT. Treatment of Class II Malocclusion. Seminars in Orthodontics.2002:8; 141-148.
- Jakohsson S. Cephalometric evaluation of treatment effect on Class II, division I malocclusions. Am J Orthod. 1967;53:446-457.
- Kandel ER, Schwartz JH, Jessel TM. Principles of neural sciences. New York; McGraw Hill, 2000.
- Kok LDP, Bendeus M, Hägg U , Hansen K, Rabie M. Comparison of the headgear activator and Herbst appliance — effects and post-treatment changes. European Journal of Orthodontics. 2006; 28: 594–604.
- Lai W, Lu S, Huang N, Zhao M. An eight-factor analysis of early skeletal Class II malocclusion using Fränkel appliance. Hua Xi Kou Qiang Yi Xue Za Zhi. 1999 ;17:271-274.
- Marşan G. Effects of activator and high-pull headgear combination therapy: skeletal, dentoalveolar, and soft tissue profile changes. Eur J Orthod. 2007;29:140-8.
- McNamara JA Jr, Howe RP, Dischinger TG. A comparison of the Herbst and Fränkel appliances in the treatment of Class II malocclusion. Am J Orthod Dentofacial Orthop. 1990;98:134-144.
- Nedeljković N, Sćepan I, Glisić B, Marković E. Dentaoalveolar changes in young adult patients with class II/1 malocclusion treated with the herbst appliance and an activator. Vojnosanit Pregl. 2010 ;67:170-175.
- Pancherz H. Treatment of Class II malocclusions by jumping the bite with the Herbst appliance. A cephalometric investigation. American Journal of Orthodontics .1979;76 : 423 – 442.
- Rock W. Treatment of Class II malocclusions with removable appliances. Part 4. Class II division 2 treatment. British Dental Journal.1990; 168: 298–302.
- Sander FG. Indikation für die Anwendung der Vorschubdoppelplatte.Prakt Kieferorthop. 1988;2:209–22.
- Van Beek H. Overjet correction by a combined headgear and activator. European Journal of Orthodontics .1982; 4:279 – 290.
- Vardimon AD, Graber TM, Voss LR, et al. Functional orthopedic magnetic appliance (FOMA III) – modus operandi. Am J Orthod Dentofacial Orthop 1990;97:135–148.
- Weiland FJ, Bantleon HP. Treatment of Class II malocclusions with the Jasper Jumper appliance – a preliminary report. Am J Orthod Dentofacial Orthop 1995;108:341–350.