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Treatment of Maxillary Retrusion-Face Mask with or without RPE?

SUMMARY

Background/Aim: *Maxillary transverse deficiency often combines with retruded maxillary skeletal position causing a skeletal class III malocclusion. In these cases combination of rapid palatal expander and a facial mask to protract the maxilla is a very effective treatment protocol. When the maxilla is not deficient is it necessary to use palatal expansion before protracting? Should we use this combination because it has been proved to be effective? The aim of this paper is to show that maxillary protraction is also effective when applied without expanding the maxilla although there are some statistically significant changes.* ***Material and Methods****: Two groups of 20 patients each, were created for this study. The first group were treated with rapid palatal expansion and face mask. In the second group, patients were treated only with face mask.* ***Results****: Measurements made at T0 (prior to treatment) and those at T1 (after treatment) were statistically analyzed. At the end of the treatment patients of the 1st group showed significant difference for the values of SNA, SNB, ANB angles (p=0.000). Significant changes were observed also for the second group (SNA, SNB, ANB). The only differences between the two groups were observed regarding SNA angle (p=0.040) and maxillary incisor inclination (p=0.028).* ***Conclusions****: At the end of treatment, all patients showed skeletal class III correction and improved facial appearance. Significant changes of SNA angle were observed for each group. There were also significant changes in the position of the mandible. These changes contributed in skeletal class III correction but there was no significant difference between them.*

Key words: Maxillary Retrusion, Face Mask, Rapid Palatal Expansion

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Introduction

Class III malocclusion is a multifactorial etiology dysmorphosis that encompasses a broad spectrum of dental alterations or skeletal, which have in common a disharmonious proportion between the maxilla and mandible, with mandibular protrusion, maxillary retrusion and the combination of both. Various authors in their studies have found maxillary retusion the most common cause of skeletal class III malocclusion[1-7].

In 1944 Oppenheim convinced that it was impossible to control growth or mandibular advancement suggested attempts to advance the maxilla, with the aim of balancing the mandible. In 1960 Jean Delaire, a French surgeon who dealt with the treatment of palatoschisis used the facial mask to protract the maxilla.

In the coming years other authors have made modifications to the mask or and anchoring elements. The expansion is intended to open the circummaxillary sutures or "disarticulate" the maxilla to allow for its protraction. The combination of rapid expansion and postero-anterior traction of maxilla through facial mask protocol constitutes an almost unique treatment of skeletal class III

malocclusion caused by maxillary transverse deficiency and retrusion.

By using this protocol several effects can be achieved such as anterior displacement and counterclockwise rotation of the maxilla, downward and backward rotation of the mandible, forward movement of upper incisors, retroclination of mandibular incisors, and increase in the lower face height[2,8,9]. Among this treatment effects there is also the improvement of the profile with an esthetic benefit for the patients with maxillary retrusion. The change of the profile and also the remarkable change of the facial appearance almost always encourage a better cooperation from the patients.

The aim of this paper is to show that maxillary protraction is also effective when applied without expanding the maxilla although there are some statistically significant changes.

Material and Methods

The sample for this study consisted of 40 patients (21 girls, 19 boys), average age (10y, 7mos) with maxillary retrusion and/or transverse maxillary deficiency. Inclusion criteria were: Skeletal class III caused by maxillary retrusion ANB (-), molar and/or canine class III, no previous orthodontic treatment.

The sample was divided in 2 groups with 20 patients each. The first group (11 girls, 9 boys, and mean age 10y, 5mos) was treated with postero-anterior traction with facial mask (FM). The second group (10 girls, 10 boys, and mean age 10y, 1mos) was treated with maxillary expansion and postero-anterior traction (RPE-FM). Initial treatment records included study models, extra and intraoral photographs, panoramic and lateral X-rays. Cephalometris analysis was performed using 15 angular and linear measurements (Figures 1 & 2).

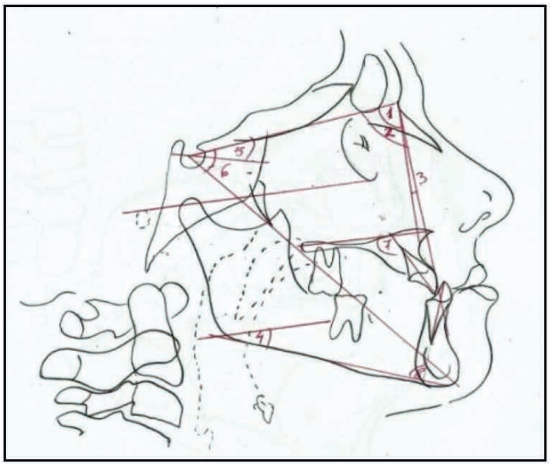


Figure 1. Angular measurements

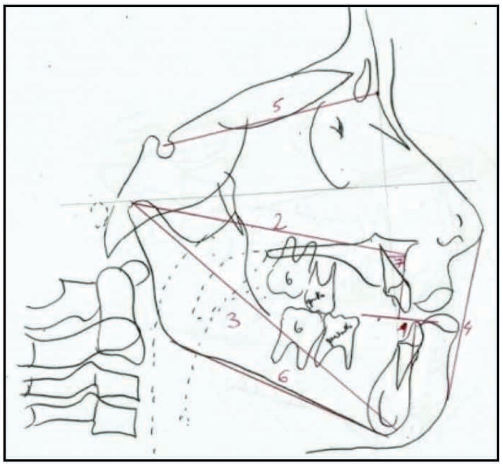


Figure 2. Linear measurements

Treatment protocol

For the patients of FM group the Verdon double arch served as anchor unit (Figure 3).

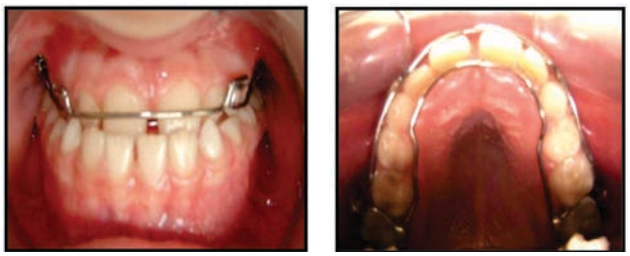
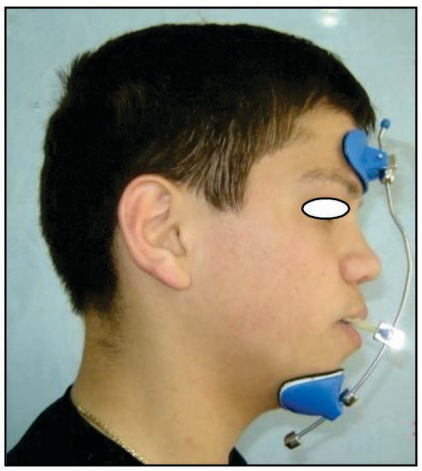


Figure 3. The double arch Verdon

All patients were asked to wear the facial mask 14 hours/day. A total force of 600gr were used, traction direction was 30^0 under the occlusal plane (Figure 4).



Fiureg 4. Direction of traction

The second group RPE-FM was treated by applying the extraoral traction after maxillary expansion. Same wearing of facial mask was asked. The force was 600 gr and traction direction was 30^0 under the occlusal plane.

Statistical analysis

Measurement made at T0 (prior to treatment) and those at T1 (after treatment) were statistically analyzed. After determining the distribution of the data and homogeneity of variance, an independent sample test was used to assess the differences between the groups. Statistical significance was indicated by a p value 0.05.

Results

Descriptive analysis for the 1st and 2nd group are showen in Table 1. and 2. The t-test was used to make the comparison between the groups (Table 3).

FM group

At the end of the treatment patients of this group showed significant difference for the values of SNA, SNB, ANB angles (p=0.000). The increase of SNA angle with 1.55^0 indicates the efficacy of facial mask by advancing the maxilla. There were also linear measurements that confirmed the efficacy of the treatment such as increase of A point and Wits. The vertical measurement showed no significant differences (Table 4).

Dental effect were also observed and the end of the treatment. The inclination of maxillary incisors was 4.55^0 (p=0.000). This can be considered a desired effect since they are retruded as well as the maxilla in the patients with skeletal class III.

Table 1. Descriptive analysis for the 1st group

Measurement	Ave		SE		DS		p
	T0	T1	T0	T1	T0	T1	
SNA	78.39	80	0.496	0.464	2.1	2.02	0.000
SNB	81	79.61	0.474	0.295	2.06	1.2	0.000
ANB	-2.5	0.39	0.361	0.358	1.57	1.560	0.000
SNGOME	33.37	33.89	0.568	0.586	2.47	2.55	0.123
FH-GOME	26.39	26.68	0.790	0.508	3.442	2.212	0.020
Y axis	66.68	67.00	0.2841	0.301	1.238	1.312	0.360
U1-PP	100.50	105.13	0.848	0.770	3.697	3.358	0.000
L1-GOME	87.58	88.42	1.041	0.797	4.53	3.083	0.069
Co-A	80.05	81.74	1.329	0.762	5.795	3.32	0.107
Co-Gn	105.45	109.13	2.132	1.83	9.29	7.9841	0.000
Wits	-3.553	-1.97	0.2475	0.272	1.078	1.184	0.000
A point	-2.58	-0.74	0.240	0.214	1.044	0.933	0.000
Go-Me	73.1316	75.02	1.506	1.425	6.576	6.214	0.502
Se-N	69.736	72.23	1.620	1.614	7.063	7.036	0.222
E line	-.0631	-0.39	0.362	0.295	1.579	1.286	0.348

Table 2. Descriptive analysis for the 2nd group

Measurement	Ave		SE		DS		p
	T0	T1	T0	T1	T0	T1	
SNA	77.47	79.77	0.499	0.4552	2.23	2.03	0.000
SNB	79.98	78.80	0.437	0.354	1.93	1.58	0.000
ANB	-2.55	0.075	0.28	0.38	1.25	1.72	0.000
SNGOME	32.95	33.67	0.506	0.504	2.26	2.255	0.000
FH-GOME	25.25	26.13	0.7159	0.656	3.20	2.933	0.000
Y axis	66.55	66.93	0.357	0.331	1.59	1.480	0.030
U1-PP	103.98	108.58	1.348	1.048	6.02	4.68	0.000
L1-GOME	85.53	85.45	1.221	1.030	5.462	4.605	0.977
Co-A	80.18	81.22	1.29	1.260	5.779	5.637	0.000
Co-Gn	104.53	106.58	1.894	1.603	8.470	7.168	0.009
Wits	-4.20	-1.73	0.255	0.234	1.140	1.045	0.000
A point	-2.950	-1.20	0.2638	0.236	1.179	1.056	0.000
Go-Me	73.03	75.05	1.781	1.8205	7.964	8.141	0.065
Se-N	66.90	67.7	1.395	1.339	6.240	5.99	0.060
E line	-0.50	-0.03	0.295	0.263	1.318	1.175	0.011

Table 3. Comparison using t test between the groups

Group	FM		RPE-FM		
Measurement	Mes	DS	Mes	DS	p
SNA	80	2.02	79.77	2.03	0.040
SNB	79.61	1.2	78.80	1.58	0.227
ANB	0.39	1.560	0.075	1.72	0.265
SNGOME	33.89	2.55	33.67	2.255	0.777
FH-GOME	26.68	2.212	26.13	2.933	0.436
Y axis	67.00	1.312	66.93	1.480	0.793
U1-PP	105.13	3.358	108.58	4.68	0.028
L1-GOME	88.42	3.083	85.45	4.605	0.321
Co-A	81.74	3.32	81.22	5.637	0.848
Co-Gn	109.13	7.9841	106.58	7.168	0.062
Wits	-1.97	1.184	-1.73	1.045	0.572
A point	-0.74	0.933	-1.20	1.056	0.136
Go-Me	75.02	6.214	75.05	8.141	0.992
Se-N	72.23	7.036	67.7	5.99	0.061
E line	-0.39	1.286	-0.03	1.175	0.294

Table 4. The p value for the 1st group

Measurement	T0	T1	dif	p
SNA	78.39	80	1.550	0.000
SNB	81	79.61	-1.47	0.000
ANB	-2.5	0.39	2.89	0.000
SNGOME	33.37	33.89	0.526	0.123
FH-GOME	26.39	26.68	0.29	0.120
Y axis	66.68	67.00	0.32	0.360
U1-PP	100.50	105.13	4.550	0.000
L1-GOME	87.58	88.42	0.8	0.069
Co-A	80.05	81.74	2.00	0.001
Co-Gn	105.45	109.13	3.775	0.107
Wits	-3.553	-1.97	1.06	0.000
A point	-2.58	-0.74	-1.82	0.000
Go-Me	73.1316	75.02	0.25	0.502
Se-N	69.736	72.23	1.56	0.222
E line	-.0631	-0.39	-1.07	0.348

RPE-FM group

As shown in Table 5 after expansion and traction there is significant maxillary advancement (at T0 SNA-angle 77.47^0 atT1 79.77^0, p=0.000). In achieving better correction of skeletal class III helps also reduction of SNB (p=0.000). Maxillary advancement by this treatment protocol is confirmed also by the increment of A point with 1.75mm and Wits with 2.47mm. Clinically changes observed in the vertical plane helped in correction of cross bite and better facial aesthetics.

Table 5. The p value for the 2nd group

Measurement	T0	T1	dif	p
SNA	77.47	79.77	2.30	0.000
SNB	79.98	78.80	-1.47	0.000
ANB	-2.55	0.075	2.625	0.000
SNGOME	32.95	33.67	0.725	0.000
FH-GOME	25.25	26.13	0.88	0.000
AKSI Y	66.55	66.93	0.325	0.030
U1-PP	103.98	108.58	4.60	0.000
L1-GOME	85.53	85.45	0.029	0.977
Co-A	80.18	81.22	1.04	0.000
Co-Gn	104.53	106.58	2.05	0.009
Wits	-4.20	-1.73	-2.47	0.000
Pika A	-2.950	-1.20	-1.75	0.000
Go-Me	73.03	75.05	2.2	0.065
Se-N	66.90	67.7	0.8	0.060
Linja E	-0.50	-0.03	0.475	0.011

Analysis of two protocols confirmed their efficacy in the treatment of skeletal class III malocclusion due to maxillary retrusion (Table 6). The only differences between the two groups were SNA angle (p=0.040) and maxillary incisor inclination (p=0.028). Regarding the other measurements no significant differences were observed.

Table 6. The p value for the comparison between 2 groups

Group		FM			RPE-FM		
Measurement	T0	T1	dif	T0	T1	dif	p
SNA	78.39	80	1.550	77.47	79.77	2.30	0.040
SNB	81	79.61	-1.47	79.98	78.80	-1.47	0.227
ANB	-2.5	0.39	2.89	-2.55	0.075	2.625	0.265
SNGOME	33.37	33.89	0.526	32.95	33.67	0.725	0.777
FH-GOME	26.39	26.68	2.336	25.25	26.13	0.88	0.436
Y axis	66.68	67.00	0.32	66.55	66.93	0.325	0.793
U1-PP	100.50	105.13	4.550	103.98	108.58	4.60	0.028
L1-GOME	87.58	88.42	0.8	85.53	85.45	0.029	0.321
Co-A	80.05	81.74	2.00	80.18	81.22	1.04	0.848
Co-Gn	105.45	109.13	3.775	104.53	106.58	2.05	0.062
Wits	-3.553	-1.97	1.06	-4.20	-1.73	-2.47	0.572
A point	-2.58	-0.74	-1.82	-2.950	-1.20	-1.75	0.136
Go-Me	73.1316	75.02	0.25	73.03	75.05	2.2	0.992
Se-N	69.736	72.23	1.56	66.90	67.7	0.8	0.061
E line	-.0631	-0.39	-1.07	-0.50	-0.03	0.475	0.294

Discussion

One of the most important effects of this treatment the increase in SNA angle observed in other studies[1,3,7] can be observed in this paper as well. Respectively, 1.50 degree and 2.30 degree for the FM group and RPE-FM group were the changes indicating maxillary advancement. Significant changes in the mandibular position also contributed to the class III correction in both groups. The downward and backward movement of the chin expressed in this study was described by Ishii et al.[6], Takada et al.[12], and Nartallo-Turley[10] using palatal expansion with a facemask. Various soft tissue changes combined to improve the patient's class III profile. The changes of the profile was more convex due to forward movement of the upper lip and retraction of the lower lip, thus soft tissue pogonion moving back and menton moving down as described by Kapust et al.[1].

A very important factor in the successful treatment of skeletal class III malocclusion is patient`s age. Takada et al.[12] examined 61 Japanese female patients with class III malocclusion, divided into three groups (7 to 10 years, 10 to 12 years, and 12 to 15 years). They concluded that a greater orthopedic effect was observed when therapy was applied before or during the pubertal growth spurt (7 to 12 years). Baik[2] studied maxillary expansion and protraction in 47 Korean subjects, divided into three groups (<10 years, 10 to 12 years, and 12 years or older). He concluded that age did not show any statistically significant difference in treatment effects of expansion/facemask therapy. Braun[11] studied 63 subjects aged 4–13 and found that expansion/facemask therapy produces dentofacial changes that combine to improve class III malocclusion. They reported that, although early treatment may be the most effective, facemask therapy can provide a viable option for older children as well.

Mean age of patients for this study was 10.7 years. The result obtained are in accordance with previous studies[2,11,12] but cannot be compared in order to determine the best age for starting the treatment. In order to find such conclusion the sample must be larger and divided according to age. At the end of treatment, all patients showed skeletal class III correction and improved facial appearance. Significant changes of SNA angle were observed for each group. This indicates maxillary advancement. There were also significant changes in the position of the mandible. These changes contributed in skeletal class III correction but there was no significant difference between them.

The significant difference of SNA angle in RPE-FM group has not only statistical significance. Clinically implies more stable results. This may also help in compensation in case of unfavorable mandibular growth. The other difference found regarding maxillary incisors in the RPE-FM group could be considered desired effect since they were retruded and more proclination not affecting the aesthetics.

Conclusions

In absence of maxillary transverse deficiency by protracting maxilla it is possible to correct skeletal class III without expanding. This means that is not always necessary to expand because maxillary protraction can correct skeletal class III malocclusion.

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