Cephalometric Evaluation of an Oral Stabilizing Appliance with the Modified Milwaukee Brace

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Studies done in the past twenty years on the use of the original Milwaukee brace in scoliosis therapy demonstrated the damageable effects caused by this brace to the patients' dentofacial complex.[1-4] This fact led to the necessity of wearing an oral appliance at least ten hours a day during the period of treatment with this brace to minimize the detrimental effects on the dentition and on the facial growth pattern.

In 1969 the chin pad in the original Milwaukee brace was replaced by a plastic throat piece to reduce the pressure to the mandible and thus permit a more normal dentofacial development (the modified brace).[6,7]

Northway and Alexander[6] evaluated the dentofacial effects caused by the modified brace with respect to the original brace and came to the conclusion that "when the modified Milwaukee brace is used with a permanent dentition, an oral stabilizing appliance appears no longer necessary." In their study none of the patients, however, wore an oral stabilizer. Additional beneficial effects which may be due to an oral appliance were not directly tested.

The purpose of this study was to evaluate the effects of an oral stabilizer with scoliosis patients. All the patients wore the same type of the modified Milwaukee brace, some with an oral stabilizer and some without. The results show no additional beneficial effects due to wearing an oral appliance with the modified brace thus confirming the same conclusion reached by Northway and Alexander.

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LITERATURE REVIEW

Scoliosis is the term applied to the lateral curvature of the vertebral column. It is a medical enigma. It exists presently as a clinical entity without a known etiology. It occurs only in human beings and usually in females. It is classified as mostly idiopathic, but may be paralytic (post poliomelitic). Whether idiopathic or paralytic, the patients are characterized by similar progressive structural bone changes that are evident only during growth and terminate when growth ceases.

Several experimental manipulations in animals have been successful in reproducing spinal curvatures, but none have advanced significantly the remedy for scoliosis in humans. The disease is usually discovered in childhood and progresses during the growth period. This curvature can lead to lifelong disfigurement if left untreated. In some cases the curve may become severe enough to impair respiration, circulation and digestion.

Valuable contributions to surgical amelioration of spinal deformities have been made by Harrington and Dioyer.[8] In 1946 Blount and Schmidt[9,10] provided the medical profession with the "Milwaukee brace," a successful orthosis for scoliosis therapy. Patients treated by the Milwaukee brace can carry on their daily activities to some limited extent with the appliance. The mandible received some portion of the pressure

applied to the cranium through the chin pad.

Howard[11] in 1926 noted the dental changes in two scoliotic children treated by plaster casts (a method of treatment before the Milwaukee brace). The changes were extreme loss of vertical dimension, protrusion of upper and lower anterior teeth, and submersion of posterior teeth.

Alexander,[1] Fairleigh,[2] Watson,[3], Gee,[4] and Eastman,[5] all found in their studies on scoliosis patients treated with the original Milwaukee brace that the brace had damaging effects on the dentofacial pattern and that an oral stabilizing appliance minimized these effects.

The Milwaukee brace has undergone many modifications since its creation. The chin pad in the original brace was replaced by a plastic throat piece in a lower position and closer to the neck. Its posture is underneath the body of the mandible just above the thyroid cartilage, so that the patient would not be able to rest the mandible on the throat piece, as was previously done with the chin pad. The rigid occipital pad was changed into flexible plastic uprights to allow the patient to tip his head backwards. This modified brace is more comfortable to wear with less pressure exerted under the mandible.

Persky and Johnston[7] came to the conclusion that "only minute dental changes accompanied the use of the new Milwaukee brace . . . , the changes differed markedly from the dramatic alterations reported for the old brace."

Material and Method

Initial and progress cephalometric data recorded on sixteen female scoliosis patients were used in this study. The patients were from the Scoliosis Department at Belinson Hospital, Tel-Aviv. All the patients wore the modified Milwaukee brace. Seven patients wore an oral stabilizer; nine did not.

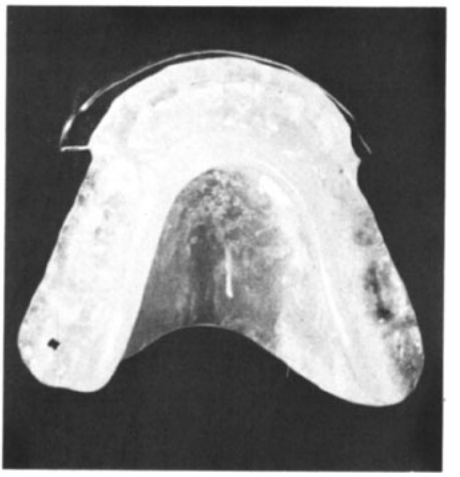

Fig. 1 Oral stabilizer used.

The age range was from 12 to 16 years; the brace-period ranged from as low as five months to a maximum of 24 months.

The oral stabilizer used in this study (Fig. 1) is made of acrylic material which covers all the occlusal surfaces of the upper and lower teeth, the labial incisal third of the six lower anterior teeth, and the vault of the maxilla. It has a labial arch of 0.8 mm thickness, made of stainless steel wire, whose function is to retain the labial surfaces of the upper six anterior teeth. This acrylic block appliance is constructed with the bite opened within the physiological freeway space of centric occlusion (usually 2-3 mm). Patients were instructed to wear this appliance ten hours a day during the entire period of the brace therapy. A monthly check of each patient's dentition was carried out and the patient was asked about any problems encountered as a result of wearing the stabilizer, such as TMJ pains, soreness of gingival tissue, or any other problem concerning his oral cavity.

For each patient in both groups the following records were taken in the pretreatment and progress treatment of the brace therapy: lateral cephalograms,

Parameter	I		II		t	Prob.
	Mean diff.	St. error	Mean diff.	St. error		
X_1	-1.4444	-1.725	-0.4286	-2.277	0.36	0.722
X_2	2.3333	1.067	0.4286	0.922	1.30	0.213
X_3	-0.2222	-1.051	1.2857	1.107	0.98	0.345
X_4	-0.2222	-0.722	0.2857	0.644	0.51	0.619
X_5	-0.6667	-0.601	1.2857	0.837	0.62	0.547
X_6	0.4444	0.603	-0.5714	-0.369	1.33	0.203
X_7	0.3333	0.816	0.1429	0.143	0.20	0.843
X_8	0.2222	0.596	-0.1429	-0.340	0.49	0.631
X_9	0.1111	0.716	-0.5714	-0.571	0.71	0.488
X_{10}	0.4444	0.242	0.4286	0.612	1.45	0.169
X_{11}	0.2222	0.222	-0.4286	-0.571	0.37	0.718
X_{12}	0.5556	0.503	-0.2857	-0.565	1.11	0.286

TABLE I

Statistical Differences Between Groups I and II

study models, photographs of the teeth in centric occlusion, and facial photographs. Pretreatment and progress treatment cephalograms of each patient were traced.

Nine cephalometric anatomical landmarks were considered. They are listed below. From these landmarks twelve parameters were measured: the first five are angular measurements and the last seven are linear measurements recorded in mm. The angles are: (X_1) $\underline{1}$ to $\overline{1}$, (X_2) IMPA, (X_3) $\underline{1}$ to SN, (X_4) OM to GO-GN, (X_5) GO-GN-SN.

Seven linear measurements in mm were recorded: (X_6) N-Menton, (X_7) N-ANS, (X_8) ANS-Mn, (X_9) posterior face height (sella to mandibular plane), (X_{10}) sella to ANS-PNS line, (X_{11}) upper first molar height (tip of mesiobuccal cusp to palatal plane), and (X_{12}) lower first molar height (mesiobuccal cusp to mandibular plane).

Results and Discussion

Table I compares the statistical differences between Group 1 (without stabilizer) and Group 2 (with stabilizer). Applying the (t) test and probability for each of the twelve cephalometric parameters, we see that in all the parameters there are no significant differences.

Correlation coefficients demonstrated that the age of the patient at the beginning of treatment had no effect on the cephalometric measurements recorded during brace therapy.

Conclusions

In conclusion we found that:

I. Patients wearing the modified Milwaukee brace did not exhibit detrimental changes in dental or skeletal relationships.

II. An oral stabilizing appliance is not prophylactically necessary with the

modified brace when all the teeth present in the mouth are permanent teeth and the brace period does not exceed that in the study (i.e., 24 months).

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ACKNOWLEDGMENTS

Thanks are given to Dr. L. Shashua for his advice on the statistical analysis, Dr. Lotam, Dr. Miron and Mrs. Horowitz for locating the patients, and to Mrs. D. Dayan for her help.

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