

Research Article

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Treating Orofacial Dyskinesia with Functional Physiotherapy in the Case of Frontal Open Bite

S. Daglio, R. Schwitzer, J. Wüthrich and G. Kallivroussis

Oral myofunctional therapy was found to be successful, in a group of 75 patients, ages six to 22 all with anterior open bites. Seventeen of 19 who lisped before therapy eliminated the lisp. Upper respiratory system allergies were eliminated in nine of 11 patients. A combination of myofunctional therapy and orthodontic treatment was more successful in correcting lip resting posture than was therapy alone. Lip and tongue resting postures, along with swallowing patterns, were corrected to a highly significant degree.

INTRODUCTION

Diagnosis and treatment of orofacial dyskinesia are important aspects of orthodontic therapy (Hotz, 1980; Reichenbach and Taatz, 1971). Dysfunctions are usually corrected as one therapeutic stage within the framework of an overall treatment program. The assumption is that the success of the treatment and the stability of its results are fundamentally jeopardized by the failure to identify dysfunctions and habits of this nature.

This retrospective study investigated the extent to which lip and tongue dyskinesia can be treated successfully by means of functional orofacial physiotherapy. In particular, the intent was to address the question—scarcely discussed in the literature—of whether morphological disorders encountered in malocclusions (in this instance, frontal open bite) can also be treated successfully by regulating orofacial dysfunctions as the sole therapeutic modality.

PATIENT POPULATION AND METHOD

A total of 75 patients (22 boys, 53 girls) between 6 and 22 years of age took part in the open clinical/therapeutic study. Girls were heavily over-represented with a proportion of 71%, compared with 29% boys.

Dental - orthodontic findings

All 75 patients exhibited lip and tongue dyskinesia. In addition to these functional disorders, all patients displayed a clinically manifest frontal open bite. The initial overbites varied between a minimum of -8 mm and a maximum of 0 mm (mean value \pm standard deviation: -2.1 ± 2.0 mm). Thirteen patients displayed a lateral open bite in addition to a frontal open bite. Besides an open bite, additional morphological defects were also diagnosed in a total of 48 patients. These were cases of

multiple malocclusion, 39 of which involved anterior tooth gaps. All the patients participating in the study had a history of a sucking habit; however, at the start of the investigation only 6 patients still sucked (equivalent to 8%).

The sagittal jaw relation was defined by means of the customary classification according to Angle, with the relation in the six-year molar zone serving as the distinguishing criterion. A distocclusion (Angle II) was found in a total of 48 patients (64%), followed by 22 patients (29.3%) with neutral relation (Angle I). A mesio-occlusion (Angle III) was diagnosed in 2 patients (2.7%). There were no data on Angle classification for 3 patients.

Otorhinolaryngological findings

Before treatment, 19 patients lisped on /s/ (sigmatism). Whereas almost 70% of all boys participating in the study displayed sigmatism, this was the case in only 23% of the girls. Patency of the nasal passages was examined with the mirror test. The proportion of the patients with nasal obstructions was 27%. Before treatment, 11 patients had allergic rhinitis.

Functional analysis

Lip dyskinesia was recorded and documented at the beginning and end of treatment, both by clinical observation (retraction of the lower lip during swallowing, anomalous lip closure, oral respiration), and by systematic measurements (masseter activity during swallowing, lip pressure, lip resistance). The myoscanner was used to measure masseter activity and lip pressure; a spring balance was used to determine lip resistance.

The following were defined as worthwhile therapy goals: 1) no hypercontraction of the mentalis during swallowing, 2) lip pressure between 0.6 and 0.8 p, and 3) lip resistance between 1400 and 2700 g.

Clinical observations and objective measurements were also used to assess dyskinesia of the tongue. Clinical observations were used to check the following parameters: 1) frontal interdental tongue resting position, 2) lateral interdental tongue resting position, 3) frontal tongue pressing during swallowing, 4) lateral tongue pressing during swallowing, and 5) masseter activity during swallowing. A total of 28 patients (37%) were lateral tongue pressers (thrusters) prior to treatment.

The following data were collected on the basis of objective measurements: masseter circumference dur-

ing swallowing and tongue pressing (measured with the myoscanner), Payne test with incisal point, medial point and lateral point (visualized with the fluorescent paste and UV lamp).

RESULTS

Otorhinolaryngological findings after completion of the therapy

Sigmatism was diagnosed in only two patients after completion of the therapy. This reduction in the number of patients with an articulatory disorder proved to be highly significant statistically ($p < 0.001$). The decline in the proportion of patients with nasal obstructions after conclusion of treatment was also highly significant statistically ($p < 0.001$). Of the 11 patients suffering from allergies in the upper respiratory tract before treatment, two patients no longer displayed any allergic symptoms at the conclusion of the treatment.

Therapy-related homogeneity test

The therapy-related homogeneity test demonstrated ($p < 0.05$) that patients who subsequently received only orofacial physiotherapy treatment displayed an anomalous lip closure less frequently (79%) than those patients who were subsequently treated with physiotherapy and orthodontic appliances (96%).

Age-related homogeneity test

The age-related tests showed ($p < 0.05$) that patients under 10 years of age retracted their lower lip more frequently when swallowing (75%) than older patients (47%). By contrast, it was demonstrated ($p < 0.05$) that older patients more frequently pressed laterally when swallowing prior to treatment (53%) than younger patients (29%). A lateral open bite was also diagnosed more frequently in patients less than 10 years of age (91%) than in older patients (45%).

Orthodontic findings after completion of the therapy

Cephalometric analysis

The changes in jaw base angle established by cephalometric analysis after completion of the therapy were highly significant statistically ($p < 0.001$), but not clinically relevant (from an average of 32.7° before therapy to an average of 31.1° after therapy). There was also a statistically significant difference ($p < 0.001$) between the measurements of the interincisal angle before and after treatment, but the clinical significance of this finding also seemed doubtful.

Dyskinesia

In all 3 parameters observed in connection with lip dyskinesia (retracting the lower lip when swallowing, anomalous lip closure, oral respiration), statistical evaluation indicated a highly significant normalization after conclusion of the therapy ($p < 0.001$). A highly significant

normalization ($p < 0.001$) after conclusion of the therapy was also apparent on the basis of objectively measured factors (mentalis activity, lip pressure and lip resistance).

Achievement of a normal swallowing pattern and correction of tongue pressing (thrusting) were also highly significant statistically ($p < 0.001$). The correction of tongue function by physiotherapy was confirmed with highly significant statistical certainty ($p < 0.001$).

Open bite

A highly significant correction after treatment ($p < 0.001$) was recorded for lateral open bite in the total population. It must be pointed out here that five of the total 13 patients with open bite in the molar zone had been treated solely with myofunctional physiotherapy.

The overbites used as the parameter for the extent of frontal open bite varied after conclusion of the treatment between a minimum of -2 and a maximum of $+4.5$ (mean value \pm standard deviation: $+2.1 \pm 1.3$). This clinically relevant morphological change was highly significant statistically ($p < 0.001$).

The hypothesis that "in respect of overbite there is no difference in therapeutic effect between patients being treated solely with physiotherapy and patients receiving combined physiotherapy/orthodontic treatment" could not be rejected at the significance level of $p = 0.05$. However, the favorable effect on the open bite confirmed by statistics had to be corrected to eliminate the influence of age, which represented a major factor extraneous to the therapy: it would be theoretically conceivable for spontaneous corrections of the overbite to have occurred due to age in the average of 2.6 years that have elapsed since the initial findings were recorded, thus simulating the success of the myofunctional therapy.

The possibility of a correlation between age and overbite was first studied by means of a correlation analysis; however, this did not reveal any significant relationship (coefficient of correlation $r = -0.0171$; $p > 0.05$).

Since correlation analyses of this kind can only indicate tendencies, 2 age groups were formed (< 10 years of age, i.e. before completion of anterior dentition, and > 10 years of age, i.e. after completion of anterior dentition) and examined as to whether there is a statistically-based difference between the average overbite values of these sub-populations. The null hypotheses could not be rejected at a significance level of $p = 0.05$.

The comparison of overbites between the two defined age groups after treatment showed a statistically-based difference ($p < 0.05$) with homogeneous initial values; better final overbite results were attained on average when treatment commenced early (before completion of anterior dentition). In the age group < 10 years, an average overbite of $+2.4$ was recorded after completion

of the treatment; in the age group ≥ 10 years, this value was only +1.8.

Individual case studies

On subjective assessment of treatment success as conducted by the investigating physicians at the conclusion of treatment, therapy was rated as unsuccessful in two patients. These involved the following:

1. Girl, 10.5 years old with frontal and lateral open bite in Class II, severe lip and tongue dyskinesia resistant to therapy. Treatment was performed as a combination of physiotherapy and orthodontics, lasting 1 year and 6 months with a total of 16 myofunctional therapy sessions. Overbite before therapy -3 mm, after therapy -1 mm. Jaw base angle before therapy 35° , after therapy 33° .
2. Girl, almost 12 years old with frontal open bite only in Class II, severe lip and tongue dyskinesia which remained resistant to therapy. Physiotherapy and orthodontics unsuccessful over a treatment period of 4.5 years and 29 myofunctional therapy sessions. Overbite before therapy -2 mm, after therapy 0 mm. Jaw base angle before therapy 28.5° , after therapy 32° .

DISCUSSION

Muscular function plays a major role in the morphology of the jawbones, dental arches and periodontium in the human masticatory system. It must now be assumed that the characteristics of the normal dentition have to include not only morphologically correct dental arch shape, regular bite and unrestricted articulation, but in particular the balanced relationship between the influences of the oral and perioral musculature (Schopf, 1972).

Muscular equilibrium is especially important in children and young people, since impairment of normal function can lead to malformation of the row of teeth or the bone structure. Tränkmann (1982) makes a distinction in orofacial dyskinesia between external dysfunctions (facial expressions and to some extent the masseter) and internal malfunctions (tongue and sublingual muscles). In addition to the lip dysfunctions often observed (lower lip interposed between the incisors of the upper and lower jaws at rest and during swallowing, lip biting, lip sucking), tongue dyskinesias are frequently diagnosed (Rakosi, 1975). Proffit (1986) demonstrated under experimental conditions that the soft tissues have an influence on the growing jaw and can cause tooth

movements or a change in growth pattern, mechanically, through the exertion of pressure. According to his results, pressure must be exerted at least four to six hours per day to have a significant effect. It has also been demonstrated that orofacial dyskinesia provokes recurrences after certain orthodontic operations (Grunert et al. 1990).

Treatment of such dyskinesias is thus required before, during or after traditional orthodontic therapy. The treatment performed is myofunctional therapy (myotherapy), which consists of specific muscle exercises of the lips and/or the tongue in order to correct the disturbance in myodynamic balance between the outer and inner orofacial circles (Tränkmann, 1982).

The test results obtained on the basis of biostatistical analyses and presented here suggest that functional disorders of the lips and tongue can be corrected with myofunctional therapy. It also seems possible to influence a frontal open bite favorably by means of orofacial physiotherapy, and in some cases even to correct it completely without employing orthodontic appliances, as long as the skeletal structures are adequate. However, the results submitted here should be interpreted with caution in light of the absence of a genuine control group. Since only patients with frontal open bite and dyskinesia were examined, there is the possibility that an age-related spontaneous correction of the open bite simulates a therapeutic effect on the part of myofunctional therapy.

The percentage of spontaneous corrections in a number of patients with frontal open bite and dyskinesia in the absence of therapy after a certain period of time would have to be established. The correlation analysis we conducted and the comparison of initial values after subdivision into two different age groups indicate that age has no effect, but this method offers insufficient statistical certainty due to the unknown probability of error (second order risks).

Our results also indicate that better treatment results can be achieved if the therapy commences before full eruption of anterior dentition. However, the present study does not permit any assessment of whether the improvement in function and morphology obtained by function-correcting measures is stable over the long term. The question of diagnosis either for solely orofacial physiotherapy or combined treatment cannot be answered conclusively on the basis of the present study. The verification of this question is the subject of a further study planned by the research group (SFOD).

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