Long term effects of the palatal plate therapy for the orofacial regulation in children with Down syndrome

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The objective of this study was to evaluate long term effects of orofacial regulation therapy with modified Castillo-Morales palatal plate on 68 Down children that attended our Unit from 1992 to 2001. Corrections obtained with palatal plate therapy were evaluated according to the following parameters: spontaneous lingual protrusion based on three level scale, position "open mouth", labial hypotonia and sialorrhea. The results showed distinct improvement in nearly all of the parameters compared to initial conditions.

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INTRODUCTION

Our clinic has been dealing with odontostomatological problems in patients with Down syndrome[1] for many years. According to a careful evaluation of our experience in treating children and young adults with trisomy 21 and to a revision of the literature on the subject, the present work aims at giving a contribution to the need to verify the therapeutic protocol established ten years ago. This protocol was made to examine the efficacy of therapy of the criteria that was implemented in the past.[6,14,14]

The first objective is related to treating the child with Down syndrome as early as possible. This treatment was done through the collaboration with the pediatricians and physiatrists working in the area and coordination with the parents of the children with Down syndrome.

Such an outcome has been obtained through an information campaign illustrating the possibilities to have, in many cases, good rehabilitative results by promptly employing a maxillary plate, the Castillo-Morales type, accompanied by an appropriate psychomotor stimulation of physiatric kind, combined with speech therapy and family relation.[3,4,17]

The malformations of the stomatognatic apparatus, which represents an indication for the application of the appliance are represented in the first place by pseudomacroglossia.

The tongue, which is hypotonic and hypomobile due to a mostly neurological deficit is excessively large and long. Therefore, the child tends to keep the mouth open and has a protruding tongue, which causes phonological, respiratory and orthodontic disorders.

The insufficient skeletal development and generalized muscular hypotonicity, is seen in a hypoplastic pemaxillary area as well as the complex alterations of the tone and motility of the orofacial musculature. The reduced dimensional development of the premaxillary area, of the orbicular musculature of the lips and of the mimic muscles (insufficient oral sealing, protruding tongue, sialorrhoea), muscular hypotonia of the tongue together with the muscular hypotonia of the palatine veil, determine problems in sucking, swallowing, oral respiration and language.[15]

Such pathological situations therefore represent further indications for the rehabilitative treatment with palatal appliance[6,9,11] which is always accompanied by exercise and early muscular stimulation of the mouth in agreement with the physiotherapist and with the parents, who can do the simple task of stimulating the gingival arch and the perioral musculature.

A number of studies confirm the improvement of the muscular function, of the closing of the mouth and a reduction of salivation after the therapy with palatal plate.[2,4,7,13]

By using video recording, Glatz-Noll and Berg[8] noticed a significant reduction of tongue protrusion after 4 to 11 months of functional therapy.

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Carlstedt and *et al.*[3] in a study on children with Down syndrome have obtained similar results after four years of treatment with palatal appliance.

The purpose of this work eas to evaluate and compare with the most recent literature, the long term effects, (a treatment period of at least three years), of the functional therapy with palatal appliance in the children with Down syndrome, who are patients at our O. U. of Odontostomatological and Special Surgery.

PURPOSE OF THE MYOFUNCTIONAL THERAPY WITH STIMULATION INSTRUMENTS

Since the 1970s various correction attempts using instruments intended to reduce the amount of saliva and to stimulate the movement of the tongue, lips and masticatory muscles have been made.[10,12]

Around the same period Castillo-Morales, physiotherapists and director of an Argentinean rehabilitation center,[5] studied the problem and tested a palatal regulation appliance.

The stimulation and early muscular correction therapy with the Castillo-Morales palatal appliance, eventually modified by other researchers[9,20] has a twofold purpose: to correct the position of the tongue by improving spontaneous motility and to act on the muscles of the lips in order to obtain an oral seal and to reduce salivation.

Such constant stimulation, from the appliance aims to block the pathological function and to promote a new functional behavior, which may be completed by the physiotherapeutic treatments and the speech therapy.

MATERIALS AND METHODS

On the basis of our clinical experience we have developed a diagnostic-therapeutic protocol, which essentially considers the odontostomatological intervention time requirements and which is articulated in three phases:

First phase: "**first visit**": to occur within the first six months of life.

Second phase: "**periodical clinical revaluation**": to be planned in collaboration with the speech therapist, the physiotherapist, otorhinolaryngologist and psychologist, between six months and two years of age.

It is during this phase that the prevention and oral hygiene program begins. The dental hygienists of our O. U. do it, which consists in giving motivation and teaching the personalized hygiene techniques both to the parents and to the children. The hygienists did the periodical checkups in correspondence with the monthly medical checkups.

In the medical record, expressly made for children with Down syndrome, we also enter data concerning alimentary habits, brushing frequency etc., the plaque and bleeding indexes.

The evaluation of such parameters together with that of dmft allows us to monitor the oral health of the children with Down syndrome in the course of time.

Where indications emerge, the therapy with the palatal appliance was done. Third phase, "**control**" occurs between two-three and twelve years of age. It consists in a dental-skeletal evaluation and in the definition of a treatment plan (surgical correction of the possible gingival hyperplasia, of the ankyloglossia and of the tecto-labial frenum, conventional orthodontic treatment).

From 1992 until today, with the purpose of evaluating at a distance the myofunctional therapy, we have taken into consideration 68 out of 92 children, who have been patients at our O.U. The criteria behind the exclusion of certain patients have been age, older than four years and skipped checkups.

The group was made up by 38 children treated with a modified Castillo-Morales appliance and by 30 children, who here only undergoing physiotherapeutic treatment by means of stimulation exercises of the orofacial musculature and periodically checked for the evaluation of the tongue and lips muscular tone.

The average age of the children at the beginning of the treatment with palatal appliance was of 15 months with a mode of 24 months and a distribution median of 8.7.

This means that half of the children included in the therapeutic protocol were maximum 8.7 months old and the remaining 50% was between 8.7 and 48 months old.

Within this group 12 children have been selected. They had undergone therapy with palatal appliance for at least three years and the treatment was considered concluded; all of the examined children had followed a special physiotherapy program from birth.

The palatal appliance we have used was made from a cast with small resin spoons and by using silicone as casting material (photo 1,2).

The following step has been the preparation of the palatal appliance, modified compared with the one proposed by Castillo-Morales.[18,19]

The appliance is formed by a resin base on which surface a stimulus button is applied; its shape and position are variable. Furthermore incisures are practiced on the anterovestibular surface for the stimulation of the upper lip musculature (photo 3).

The choice both of the position and of the type of stimulator to be applied to the plate (button, star, concave button, single globule or single fixed, rotating pearls) depends upon the requirements and on the characteristics of each individual.

The appliance was initially used for at least one hour a day, then for one hour three times a day and then removed to prevent the child from getting used to it (photo 4,5).

The following checkups were planned on a monthly basis. Improvements were noted in the medical record.

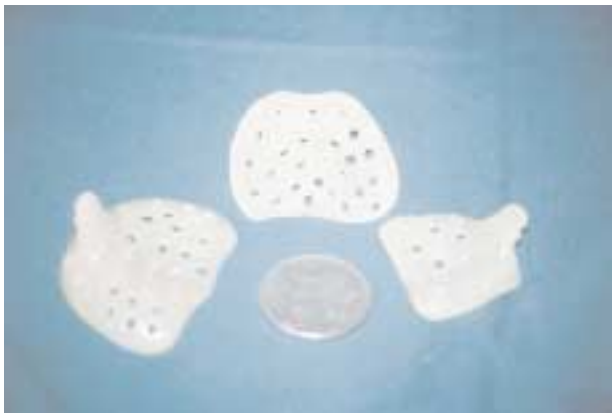

Photo 1.

Photo 2.

Photo 3.

Photo 4.

When the succudaneous tooth was lost and the permanent tooth was erupting, the appliance was modified to allow the eruption (photo 6). In some cases the treatment was interrupted for a few months due to the difficulty in retaining and suspended it when the orofacial anomalies could be considered corrected (photo 7).

RESULTS

The evaluation of the correction made with the palatal appliance, was done considering the following parameters:

The spontaneous protrusion of the tongue, evaluated in three levels:

The tongue occasionally protrudes beyond the lower lip;

The tongue slightly protrudes, but continuously, beyond the lower lip;

The tongue protrudes significantly outside the lower lip.

Open mouth position, labial hypotonicity, sialorrhoea

The examination of the cases upon completion of the treatment has underlined a significant improvement of nearly all the considered parameters, compared with the initial conditions.

At the beginning of the treatment, the patients showed a prominent protrusion of the tongue beyond the lower lip (8 out of 12 patients were treated), open mouth position (10 children out of 12, with oral respiration) sialorrhoea (7 out of 12) and prominent lip hypotonicity (8 out of 12).

Upon completion of the treatment these conditions were positively modified: the tongue protrusion was never beyond the lower lip in 9 patients out of 12 or rarely in three out of 12. The salivation had diminished on 8 out of 12, while the oral respiration was modified slightly probably due to its multifactorial etiology.

The dmft index was equal to zero, while the same index in children in pre-school age who are patients at our O.U. was equal to 3.95.

The lack of cavities on children with Down syndrome shows the effectiveness of the oral hygiene program followed by the parents and by the children with Down syndrome, who are constantly monitored by the dental hygienists.

Photo 5.

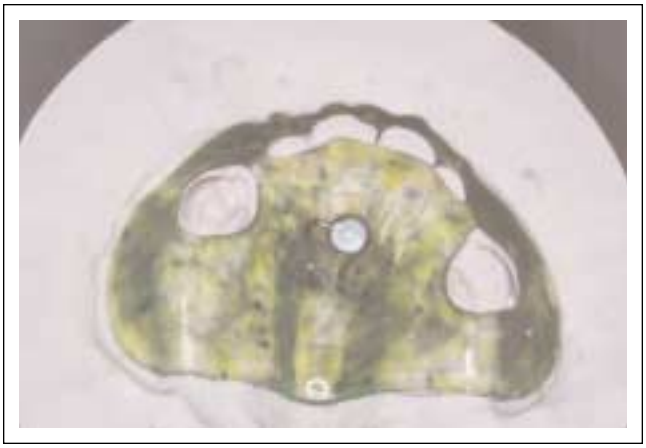

Photo 6.

Photo 7.

CONCLUSIONS

The study was done in children with Down syndrome with the purpose of evaluating the long-term effects on the functions of the orofacial musculature obtained by means of the modified Castillo-Morales palatal appliance therapy, used for at least three years. The results show the effectiveness of the orofacial re-equilibration and the importance of intervening with the muscular component from the very first months of life of the child with Down syndrome. In order to regulate the functions during the development through a specific physiotherapeutic programs, whose effects are certainly increased by the use of the palatal appliance, when considered applicable.

This underlines the central position that the principle of prevention and of the early intervention with children suffering from Down syndrome and consequently the instrumental role of the interdisciplinary collaboration to which all specialists who work on this pathology are called.

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