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Rehabilitation of the Orofacial Complex by Means of a Stimulating Plate in Children with Down Syndrome

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A – research concept and design; B – collection and/or assembly of data; C – data analysis and interpretation; D – writing the article; E – critical revision of the article; F – final approval of article; G – other

Abstract

Background. Disorders in the orofacial complex as well as muscle hypotension in children with Down syndrome can be corrected through orofacial therapy that makes use of a palatal plate.

Objectives. The aim of this paper was to present how parents of children with DS assess the availability of treatment and the therapeutic effects of orthodontic palatal plate therapy on the tongue position and mimetic muscle tension in their children; and to determine whether implementing full Castillo-Morales therapy and using only a palatal plate lead to substantially different results.

Material and Methods. The study was conducted on 100 children with DS between the ages of two months and two years (44 boys, 56 girls) who were treated by means of stimulating plate therapy. The study analyzed responses obtained from the parents to questions included in a questionnaire completed at every visit over a period of two years.

Results. The study found that in 50 patients with DS who underwent palatal plate rehabilitation there was a visible improvement of the mimetic muscles, tongue retraction and lip closure.

Conclusions. Early orthodontic palatal plate therapy ought to be an integral part of the multidisciplinary rehabilitation of patients with DS (*Adv Clin Exp Med* 2015, 24, 2, 301–305).

Key words: Down syndrome, orofacial rehabilitation, stimulating palatal plate, questionnaire survey.

Improving the quality of life and the rehabilitation of disabled people, including people with Down syndrome (DS), are frequently-discussed issues in specialist periodicals. Expectations relating to the quality of life of these people are increasing. The most important issues concern improving the standards of medical care and the social acceptance of disabled people. More and more programs are being implemented that provide comprehensive medical care as well as psychological and social support. The largest group of people with disabilities involving chromosome aberrations are people with DS [1]. Down syndrome is the most frequent cause of genetically conditioned

intellectual disability in the human population [2]. The incidence of Down syndrome in Poland is estimated at 1 in 604 live births. In 95% of the cases the extra chromosome 21 comes from the mother, and in about 5% from the father [3]. After the age of 35 the risk of a woman giving birth to a child with DS increases, and after the age of 45 the risk becomes even greater, reaching a rate of 1 in 25 live births [4, 5].

Better understanding of this disorder and steadily improving standards of medical care have resulted in extended life expectancy for people affected by DS. As recently as 1965, only about 50% of children with this syndrome lived beyond the

age of 5; in the 1980s the average life expectancy exceeded 35 years; now it is 55 years and continues to increase. The rehabilitation of children affected by this disability involves improving not only motor functions but also appearance. This is connected with the expectations of the parents, who are often interested in eliminating undesirable facial features [6, 7].

Children with Down syndrome from birth are provided with multidisciplinary medical care, including the care of an orthodontist, because such patients suffer from a multitude of genetically determined orofacial disorders as well as varying degrees of stomatognathic system dysfunctions [8, 9]. Orthodontic rehabilitation from the early months of life through adulthood can monitor and correct any functional abnormalities, as well as the development of dental and facial structures. One of the components of this kind of multi-level care for children with DS is orofacial therapy according to the Castillo-Morales method, in which the use of a palatal plate and manual therapy is an integral part of the treatment. The aim of this therapy is to eliminate tongue dysfunctions and improve the function of the *orbicularis oris* and mimetic muscles, leading to improvements in sucking, articulation, swallowing and nasal breathing [10–15].

The success of this treatment always depends on the level of cooperation with the patient, and in the case of children with DS, on the involvement of the parents.

The aim of this study was to present how parents of children with DS assess the availability of treatment and the therapeutic effects of orthodontic palatal plate therapy on the tongue position and mimetic muscle tension in their children; and to determine whether implementing full Castillo-Morales therapy and using only a palatal plate lead to substantially different results.

Material and Methods

The research material comprised the responses to 10 questions included in a questionnaire, as well as observations made by the parents of 100 children between the ages of 2 months and 2 years (44 boys, 56 girls) with DS who were given orthodontic treatment at the Poznań University of Medical Sciences (50 patients), at the Institute of Mother and Child in Warsaw (16 patients) and at Wrocław Medical University (34 patients). The children underwent rehabilitation treatment with the use of a palatal plate and stimulator for tongue verticalization (Fig. 1).

The data obtained from the responses underwent statistical analyses using STATISTICA

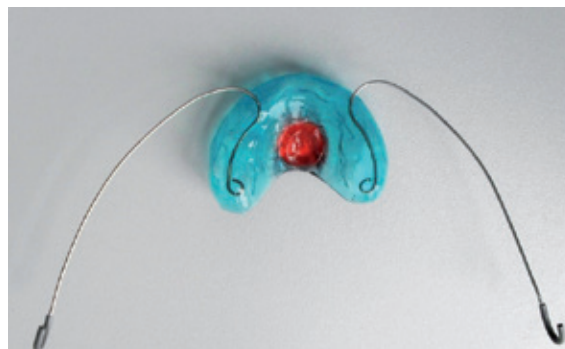


Fig. 1. Palatal plate

10.0 software (StatSoft Inc., USA). The Shapiro-Wilk test was used to verify the consistency of the analyzed quantitative variables with standard distribution. The Kruskal-Wallis test was used for comparison, and the correlation analysis was performed using the χ^2 independence test. Results of $p < 0.05$ were considered statistically significant.

The research project was approved by the Bioethics Committee at the Poznań University of Medical Sciences.

Results

The average age of the mothers when giving birth was 35 years, and the average age of the fathers was 35.5 years (Table 1).

Table 1. The age range of mothers and fathers of children with Down syndrome

Age bracket	Father (%)	Mother (%)
Below 30 years	14	18
31–40 years	74	68
Over 40 years	12	14

The parents/guardians of the children who qualified for stimulating plate therapy had obtained information from various sources about orthodontic clinics that offer rehabilitation through the use of a palatal plate. The majority of the parents were referred by speech therapists (54%); 24% received the information from various associations and foundations; 14% from family or friends; and only in very few cases was such information provided by doctors (Table 2).

The parents evaluated the availability of clinics that provided orofacial rehabilitation through the use of a palatal plate. The largest number of the parents (48%) declared that the availability was very good, 38% that it was good, and 16% thought that it was poor.

Table 2. Sources of information about a specialist orthodontic clinic offering stimulating palatal plate therapy for children with Down syndrome

Sources of information	Number
Speech therapist	54
Associations/foundations	24
Family/friends	14
Internet	4
Obstetrician/family doctor	4

The responses revealed that some children had been undergoing manual therapy according to the Castillo-Morales method. The patients who had qualified for orofacial regulation therapy with the use of a palatal plate at the three centers in the study had started to undergo manual therapy at various ages. Out of the 100 patients in the study, 60 had been undergoing Castillo-Morales manual therapy; among these, 34 had begun the treatment before the age of 3 months, 10 between the ages of 4 and 6 months, and 16 after the age of 6 months.

In 48 children, regardless of whether they were undergoing manual therapy or just palatal plate rehabilitation, the orthodontist had begun the palatal plate treatment around the age of 2 months; in the remaining children the treatment had started no later than at the age of 12 months. The rehabilitation process was monitored at 2-month intervals over a period of 2 years.

In the analysis of any correlation between plate adaptation and regularity of exercise, the χ^2

rendered a statistically significant result ($p = 0.027$), which proves that there is a connection between plate adaptation and regularity of exercise (Table 3).

In the group of children who rather quickly became discouraged by the plate, the exercises were more often irregular or sporadic than in the group of children with good plate adaptation. The children in whom plate adaptation was good were in the youngest group. Moreover, it was observed that among the patients who correctly and systematically performed palatal plate exercises, 38 were simultaneously undergoing manual therapy according to the Castillo-Morales method.

Discussion

Orofacial rehabilitation of children with Down syndrome was introduced in the 1980s. It comprises multidisciplinary medical care provided by pediatricians, geneticists, neurologists, psychologists, speech therapists and, more and more frequently, orthodontists as well. Regardless of the difficulty involved in assessing changes in mimetic muscle tension, tongue position and lip closure during and after palatal plate therapy, visual assessment remains one of the most important methods of assessing the progress of orofacial rehabilitation through the use of a palatal plate [12, 16]. Carlstedt et al. [17, 18] used video recordings to assess the progress of rehabilitation. At every stage of therapy it was essential to cooperate closely with the children's parents and to motivate them to become involved and to carefully monitor the effects

Table 3. Relationship between palatal plate adaptation and regularity of exercise in children with Down syndrome

Regularity of exercise	Plate adaptation			
	children rather quickly discouraged by the plate	increased salivation	good plate adaptation	total
Correct and systematic	6	22	30	58
Irregular	8	4	14	26
Sporadic	10	2	2	16
Total	24	28	24	100

Statistics	Exercise routine vs plate adaptation		
	χ^2	df	p
Pearson's χ^2	10.947	df = 4	p = 0.027
ML χ^2	10.421	df = 4	p = 0.034
Phi	0.468		
Contingency coefficient	0.424		
Cramér's V	0.331		

of treatment, as the ultimate outcome of the therapy largely depended on them. The current study was based on a questionnaire survey and during regular check-ups in the course of the treatment the parents were asked to respond to the questions included in the questionnaire.

Zavaglia et al. [7] studied a group of 68 children with Down syndrome and found a noticeable visible improvement in comparison to the initial condition. Similar findings were obtained by Bäckman et al. [19], who studied a group of 42 children with Down syndrome aged between 6 and 21 months. According to the literature, inserting a plate produces a reaction, described by Limbrock et al. [20], Matthews-Brzowska et al. [21] and Walasz et al. [22], involving retraction of the tongue to the back of the mouth. This reaction occurred in almost all the children in the present study. It was observed that the reaction to inserting the plate was the strongest in the early months of treatment; this was reported by the parents of children with Down syndrome in the current study, but has also been mentioned by other authors [17, 23]. Good plate adaptation in the youngest children was observed by Schuster and Giese [16], who used photographic documentation and questionnaires to assess the effects of stimulating plate treatment as part of Castillo-Morales

therapy implemented in the early stages of development of children with Down syndrome. In older children becoming discouraged with the palatal plate may be connected with the eruption of teeth, which was also observed by Bäckman et al. [24]. The parents reported that increased muscle tension also continued after the plate had been removed; thus they observed a visible improvement in their child's facial features. This was also confirmed by Krombacher et al. [25], who conducted long-term observations of patients with DS who had undergone early orofacial therapy through the use of a palatal plate.

In conclusion, orofacial therapy has a significant impact on the visible improvement of the mimetic muscles. In the majority of patients an improvement in tongue position and lip contact were also observed. Children with DS who started to receive stimulating plate treatment in infancy achieved considerable visible improvement of the mimetic muscles in the majority of cases. The results of orofacial therapy through the use of a stimulating plate obtained in this study indicate that this method is very important in the rehabilitation of patients with Down syndrome.

Early orthodontic palatal plate therapy ought to be an integral part of the multidisciplinary rehabilitation of patients with Down syndrome.

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