

Problem of Drooling in Cerebral Palsy: Physical Therapy Approach

Eman EL-Hadidy, P.T.D.* and Moshira Darwish, P.T.D.**

*Department of Physical Therapy for Pediatrics and Pediatric Surgery, Faculty of Physical Therapy, Cairo University.

**Department of Physical Therapy for Neurology, Faculty of Physical Therapy, Cairo University.

ABSTRACT

The aim of this study was to investigate the effect of physical therapy program on controlling drooling in cerebral palsied children. Fifteen cerebral palsied children CP with drooling (8 girls & 7 boys) participated in this study. Their ages ranged from 4 to 8 years. They were selected randomly following the pre-set criteria. They were evaluated before and after four months of the physical therapy program. The evaluated parameters included measuring of drooling rates ml/h and questionnaire based scoring system. The physical therapy program consisted of oral sensory stimulation, facilitation for jaw stability, chewing practice and oral exercises in front of the mirror. Finally train children were trained to acquire normal and relaxed mouth position as possible; and their parents reinforced their children verbally to swallow saliva and close their mouths. Treatment session lasted 30 minutes, two times/day, 6 days/week for 4 months. The results revealed significant decreasing in drooling rates (mL/h/day), ($P < 0.001$). Six subjects (40%) showed considerable improvement (nearly free from drooling) after 4 months of physical therapy program. Six patients (40%) were improved (mild drooling) and one subject was moderately drool (6.6 %). Two subjects were unimproved (13.3 %). As a result of this study, it is suggested that physical therapy program could be used as an effective procedure for reducing drooling in CP children.

INTRODUCTION

Salivary drooling is a common and debilitating problem in cerebral palsy (CP). It is a condition exhibited by 10-13% of all cerebral palsied children. Many problems arise such as social rejection, constant clothing wetness, chin excoriation, physical discomfort, and foul odor¹⁵. Of all the problems, the social stigma attached to drooling is the most serious and can cause isolation, demoralization and depression¹⁷.

Drooling primarily results from an overflow of saliva from the mouth due to dysfunctional voluntary oral motor activity, improper swallowing and oral sphincter deficits, and rarely from hypersalivation^{4,9,16,18}. Hypersalivation may occasionally occur as a side effect following ingestion of tranquilizers or anticonvulsants⁴. On the other hand, it is not yet proved that there is a defect in the central nervous system, which brings about true hypersalivation².

Swallowing is highly complex and incorporates sequential and patterned

movement of the lips, tongues, palate, jaws, pharynx, larynx and respiratory muscles. It is generally divided into three stages: (1) oral or voluntary, (2) pharyngeal, and (3) oesophageal¹⁷. Cineradiographic examinations showed that the pharyngeal and oesophageal stages are similar in normal persons and in those with CP who drool¹⁸. However, during the oral stage marked dysfunction of the coordinated muscle activity of the oral musculature that hampered the initiation of swallowing was identified in CP children. Disturbances in the oral stage of swallowing rather than in the pharyngeal or trigger phase are a significant cause of drooling¹⁷.

Children who drool often have trouble in swallowing their saliva. Adequate functioning of the oral (voluntary) muscles including lips (orbicularis oris), tongue and cheeks (masseter, buccinator) is necessary to maintain the lip seal⁴.

Attempts to eliminate or reduce drooling have included both invasive and non-invasive techniques¹⁵. Some examples of these strategies are anticholinergic drugs, radiotherapy¹⁴, chin pressure devices, oral musculature training^{6,8,10,13}, behavioral techniques and surgery^{8,12}.

The aim of this study was to investigate the role of physical therapy programs (including oral sensorimotor stimulation, facilitation of jaw stability, chewing practice and oral exercises) on controlling drooling for CP children.

SUBJECTS, MATERIALS AND METHODS

SUBJECTS

Fifteen cerebral palsied children with drooling participated in this study, their ages ranged from 4 -8 years (8 girls & 7 boys). The chosen subjects meet the following criteria:

- 1- Head and trunk control as confirmed by clinical examination.
- 2- Motivation and ability to cooperate in therapy.
- 3- Have the ability to participate for the duration of the study.
- 4- No medications that might interfere with treatment.

MATERIALS FOR EVALUATION

- a) Collection cup (bean - shaped) and calibrated test tube, and syringe 10 ml.
- b) Questionnaire based scoring system⁷.

METHODS

1) For evaluation:

- a) Using collection cup that is held against the subject's chin with elastic straps attached to his ears. Saliva fell into the cup and is suctioned through the tubing into a calibrated tube, where it can be readily measured. Each subject participated in 30 minutes collection for 2 sessions, one in the morning (am) and other in the afternoon (pm). Collection sessions were scheduled at least 30 minutes following a meal to allow time for saliva composition, secretion to stabilize and to allow residual food particles to be cleared from the mouth. This technique of measurement was modified from Sochaniwsky method¹⁵.
- b) The grades of the questionnaire based scoring system⁷ was as follows:
 - 1- Insignificant.
 - 2- Mild (one to two changes of clothing / day).
 - 3- Moderate (3-4 changes of clothing / day).
 - 4- Severe (more than 4 times of clothing changes / day).

Evaluations were done pre and post the physical therapy treatment.

2) For treatment:

Physical therapy treatment for 4 months included:

- Oral sensory stimulation including tactile stimulation around the child's mouth; manual vibration around the mouth followed by stretch pressure to the orbicularis oris muscle, ice stimulation for orbicularis oris and tongue muscles; pressure and tactile stimulation for the tongue.
- Facilitation of jaw stability: by using (thumb, index and middle fingers). The middle finger is the most important and was placed below the chin. The firm pressure of the middle finger enables tongue functioning to be indirectly controlled, thus, helping swallowing to be more normal. Chewing was assisted by passively rotating the lower jaw.
- Chewing practice: Lateral placement of food (chocolate, cheese) promotes alternating "biting" movements and inhibits the central jaw opening and tongue thrust pattern.
- Oral exercises in front of a mirror; protrusion of the lips forward.
- Facilitation of tongue movements (forward, backward and lateral sides).
- Each child was trained to acquire normal and relaxed mouth position as much as possible.
- Patients were practiced to close their mouth; the therapist's fingers were placed across between the patient's upper lip and nose; exercising firm and continuous pressure. This pressure lead to spontaneous mouth closure and spontaneous swallowing.

- During the day, the parents reinforced verbally their children to swallow saliva and close their mouths.

Treatment session lasted 30 minutes, two times / day, 6 days / week for 4 months.

RESULTS

The results were statistically treated by using student t-test and the level of significance was determined for drooling rates (ml / hr). The percentage of change was recorded. On the other hand, the pre and post physical therapy treatment scores were compared. From the differences in the scores, the children could be judged as nearly free of drooling, improved (mild- moderate) and impaired (unimproved).

As shown from table (1) and fig. (1) the mean value of drooling rates during morning (am) before treatment was 8.15 3.39 ml/h, which decreased after 4 months of treatment to be 4.38 3.67 ml/h, the mean difference was 3.77 1.249, which indicated a highly significant decrease ($t = 10$, $P < 0.001$).

The mean value of drooling rates afternoon (pm) before treatment was 8.49 2.4, which decreased to be 4.69 3.2 after physical therapy program, forming a mean difference of 3.9 1.88. The results showed a highly significant change ($t = 7$, $P < 0.001$).

Concerning the total drooling rates during day, the mean value was 16.64+5.5 ml/h, which underwent a decrease after treatment to be 9.06 6.8, with a mean difference of 7.58 2.85, which was statistically highly significant ($t=10$, $P< 0.001$) table (1) and fig (2).

Table (2) summarizes scoring system for drooling rates before and after 4 months of physical therapy treatment for each subject.

Table (3) shows the percent of change for 15 cerebral palsied children after four

months of treatment. Forty percent of subjects had nearly no drooling. Six subjects had mild drooling with 40% of improvement. One

subject only had moderate drooling (6.6%) while 2 subjects were unimproved (13.3%).

Table (1) shows drooling rates pre and post treatment (ml / h).

Variables	Prc	Post	Difference	SE	t	P	Sig.
Am	8.15 ± 3.39	4.38 ± 3.67	3.77 ± 1.249	0.322	10	< 0.001	Sig.
Pm	8.49 ± 2.4	4.69 ± 3.2	3.90 ± 1.88	0.487	7	< 0.001	Sig.
Total	16.64 ± 5.5	9.06 ± 6.8	7.58 ± 2.85	0.737	10	< 0.001	Sig.

am: during morning

pm: afternoon

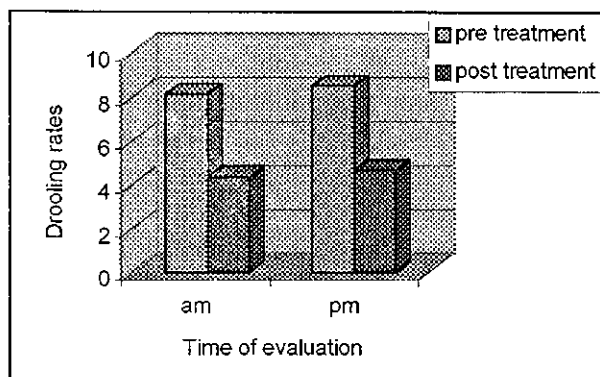


Fig (1): Mean of drooling rates ml / h for 15 cerebral palsied children before and after treatment program.

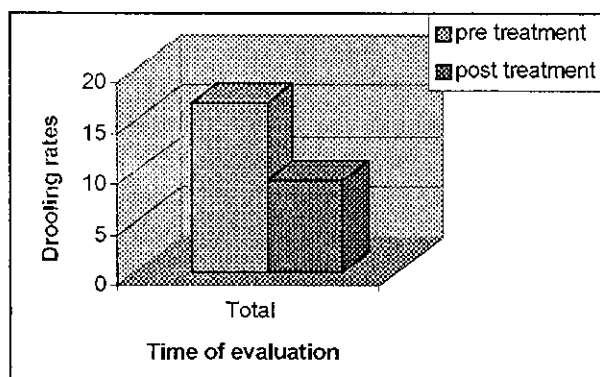


Fig (2): Mean of drooling rates ml/h during day before and after treatment program.

Table (2): Summary of scoring system for 15 cerebral palsied children with drooling before and after treatment

No.	Age y m	Sex	Scores of drooling before Treatment	Scores of drooling after treatment
1	8.0	Girl	4	1
2	4.5	Boy	4	2
3	4.0	Girl	3	2
4	5.11	Girl	3	2
5	4.10	Boy	3	1
6	5.0	Boy	3	1
7	4.9	Girl	2	1
8	4.1	Boy	2	1
9	6.3	Girl	3	2
10	7.5	Boy	4	3
11	7.0	Girl	4	4
12	6.7	Girl	4	4
13	6.5	Girl	2	1
14	5.0	Boy	3	2
15	7.6	Boy	3	2

- nearly no drooling, (1).
- mild (one to two changes of clothing / day), (2).
- Moderate (3-4 changes of clothing / day), (3).
- Severe (more than 4 changes of clothing / day), (4).

Table (3) shows percent of improvement for 15 cerebral palsied children with drooling.

Scoring system	Percents of improvement
1 nearly no drooling	40% (6 subjects)
2 mild drooling	40% (6 subjects)
3 moderate drooling	6.6% (one subject)
4 unimproved	13.3% (two subjects)

DISCUSSION

Drooling due to oral motor dysfunction or other handicapping conditions is a significant problem for many cerebral palsied children. It detracts from their physical appearance and inhibits others from engaging in social interaction with them³. Various methods have been advocated for the management of drooling in the paediatric patient and older patients with disabilities, including behavioral programmes^{3,8,13}, biofeedback techniques⁸, physiotherapy^{1,8,18}, bio-functional oral appliances^{8,11}, medication^{7,8} and surgery^{1,8,12}.

Unfortunately there were no available published results describing the effects of physical therapy on controlling drooling for CP children. A major limitation in all of the studies which have investigated methods of controlling drooling has been the inadequacy of these methods to quantify the drooling. This inadequacy makes it difficult to assess objectively and accurately the efficacy of a particular applied treatment, thus weakening the strength of any conclusions that may be drawn regarding that intervention¹⁵.

The results of this study indicated that application of the designed program of physical therapy can help in controlling drooling in CP children. This statement is made with the understanding that subjects who probably can be helped most with technique are those who meet predetermined criteria such as those described previously. This designed program provides combined inputs and therefore falls into more than one area. Sensory stimulation technique can be used to improve oral motor skills, and sensory awareness. Also techniques for facilitation of jaw stability, chewing practice and oral exercises can help in improving oral motor skills, which lead to control drooling in CP

children. Gisell, et al determined the effect of oral sensorimotor treatment on oral motor skills for 10 weeks and measured growth in moderately eating impaired children with cerebral palsy. Children were observed and domains of feeding were examined: spoon feeding, biting, chewing, cup drinking, straw drinking, swallowing and drooling. The results revealed significant improvement in all evaluated parameters except drinking skills⁵. Many investigators emphasized the importance of physiotherapy in controlling drooling for neurologically handicapped children^{1,8,18}. They reported that drooling rates can be reduced and the oral function could be better when applying physical therapy^{8,18}.

The results of this work revealed significant reduction of drooling rates ml/h at the end of treatment program as compared with the corresponding pre treatment values. This reduction of drooling rates is possible due to improvement of oral function and jaw stability.

In clinical investigation, Becmeur, et al, mentioned the possibility for reduction of drooling rates on the fact that improvement in oral motor skills can help these children to swallow saliva more competently¹.

At the end of treatment program, 40% of patients had no drooling. Also 40% of them had mild drooling. Two subjects only showed non significant changes in drooling rates. A possible explanation of this result is that these children had severe drooling and the probability of combination of several etiological factors in cases of drooling makes the choice of therapy difficult. Three patients in this study have already been treated before physical therapy program, with anticholinergics, without success.

The benefits of this treatment were not limited to eliminate drooling alone. Children were described by their therapist as being

more liked by peers and parent at home since their drooling stopped. These children learned how to stop drooling by self control of swallowing and positive reinforcement. Two girls in this study told that I like myself better when I try stop dribbling of saliva and I become a beautiful girl .

According to the findings of this work, these improvements may be due to highly repetition of multisensory stimulations, oral exercises and co-operations of parents. It can be concluded from the results of this study that physical therapy including oral sensory stimulation, jaw stability, practice of chewing and oral exercises could be used as a simple and effective procedure for reducing drooling rates in CP children. However, improvement must be supplemented by behavior and encouragement.

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الملخص العربي

مشكلة سيلان اللعاب عند الأطفال المصابين بالشلل الدماغي : مدخل العلاج الطبيعي

تهدف هذه الدراسة إلى معرفة تأثير برنامج العلاج الطبيعي على التحكم في سيلان اللعاب عند الأطفال المصابين بالشلل الدماغي. حيث اشترك في هذا البحث ١٥ طفلاً (٨ بنات ، ٧ أولاد) مصابين بالشلل الدماغي وظاهرة سيلان اللعاب وقد تم اختيارهم عشوائياً طبقاً لمعايير البحث وقد تم تقويم هؤلاء الأطفال قبل وبعد برنامج العلاج الطبيعي الذي استغرق أربعة أشهر ثم قياس معدل سيلان اللعاب بالمليمتر/ ساعة وأيضاً باستمارة استبيان معتمدة على التسجيل الرقمي. وقد احتوى برنامج العلاج الطبيعي على تنبيه حسي للفم داخلياً وخارجياً والتدريب على ثبات مفصل الفك وتأثير تمرينات خاصة بالمضغ وعضلات الفم المختلفة أمام مرآة وأيضاً تدريب الطفل على اكتساب الوضع الطبيعي للفم كلما أمكن ذلك وتحفيز الآباء لأطفالهم كلامياً لمحاولة بلع اللعاب وغلق الفم وقد استغرقت جلسة العلاج ثلاثون دقيقة في المرة الواحدة مرتين يومياً لمدة ستة أيام في الأسبوع لفترة أربعة أشهر. وقد أشارت النتائج إلى وجود نقص واضح ذو دلالة إحصائية في معدل سيلان اللعاب في اليوم الواحد ذو دلالة إحصائية . ستة أطفال (٤٠%) اظهروا تقدماً تاماً بعد أربعة أشهر (لم يعد هناك سيلان تقريباً) ستة أطفال آخرون (٤٠%) اظهروا تحسناً واضحاً (سيلان قليل) وطفل واحد (٦.٦%) أظهر درجة متوسطة من سيلان اللعاب بينما أظهر طفلان (١٣,٣%) عدم تحكم في سيلان اللعاب على الإطلاق. وطبقاً لهذه النتائج فأنه يوصى باستخدام برنامج العلاج الطبيعي كوسيلة فعالة للتقليل من ظاهرة سيلان اللعاب عند الأطفال المصابين بالشلل الدماغي .