



Effect of oral motor therapy and behavior therapy for controlling drooling in children with cerebral palsy: A comparative study

Medical Science

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KEYWORDS:

INTRODUCTION:

Drooling or sialorrhoea is the unintentional loss of saliva and other oral-contents from mouth. It is a common problem seen in as many as 10% to 13.7% of children with cerebral palsy (Ekedahl 1974; Makhani 1974). It is a normal phenomenon of infancy that subsides in early childhood, usually by 15 – 18 months of age. Occasional drooling may persist in the neurologically intact child throughout the preschool year, but drooling during wakefulness beyond 3 or 4 years of age is considered abnormal (Crysdale 1989). It may occur due to dysfunctional voluntary oral-motor activity, abnormal swallowing (Ekedahl, Manson, Sandberg, 1974), abnormal posture of jaws, lips and tongue (Scherzer & Tscharnuter 1982). There appears to be consensus, after cineradiographic studies that drooling in children with cerebral palsy is primarily due to oral-motor dysfunction and not by hyper salivation (Wilkie 1967; Ekedahl 1974; Vandey Heying et al. 1980).

Other factors contributing to drooling are the child's emotional state, head position, sitting posture, concentration, tongue size and control and inability to breathe through nose. (Sochaniwskyj et al. 1986). Burgmeyer & Jung 1983 associated oral sensation with drooling.

Drooling is a significant problem because it detracts from one's physical appearance, inhibits others from initiating social interaction, damages clothing and instructional material and presents hygiene concern (Drabman et al. 1974). Persistence of drooling into the school age leads to social isolation and the problem can be both practically and socially devastating in adolescence and adulthood (Creech; Prentice & Williams. 1991).

Drooling children have chronically irritated, macerated facial skin and in cool months the dampness from saliva is chilly. Dehydration can even become a recurrent problem as a consequence of chronic fluid loss (Blasco et al. 1992).

Because drooling is associated with infantile behavior, others may underestimate the abilities of the person who drools, thereby establishing a vicious circle of low expectation and under performance (Ray et al. 1983).

Management of drooling can be broadly divided into surgical and non-surgical. The physical losses coupled with the fact that one or more surgical procedures are required, make a non-surgical method to correct drooling preferable. Further surgery is recommended only after a trial of behavior therapy, neuro-developmental therapy or both (Crysdale 1980). Non-surgical management includes pharmacological therapy, radiotherapy, aids and appliances for controlling drooling, correction of situational factors, biofeedback, oral-motor therapy and behavior therapy.

Oral-motor therapy facilitates normal oral-motor patterns. It uses different ways of icing, brushing, tapping, stroking, vibration which are intended to improve jaw stability, mouth closure and increase tongue mobility, strength, sensory awareness or to decrease hypersensitivity.

Behavior therapy facilitates swallowing in persons who drool by making the swallowing a conscious act, so that the motor skills required can be practiced.

Since cerebral palsy (CP) is a multi disability disorder, there is no specific cause of drooling in every type of cerebral palsy child. As such, a unique treatment protocol can not be universally used in each type of cerebral palsy child. Hence it is felt that the specific treatment protocol shall be available with occupational therapist dealing with spastic CP children having drooling.

Therefore in this study an attempt has been made to design a specific protocol based on oral-motor therapy for treatment of drooling in spastic cerebral palsy children. Further an attempt has also been made to design a protocol based on behavior therapy for treatment of drooling in spastic CP children. It is only logical to know the differences between the two approaches and to find out the superiority of one approach over the other.

AIMS & OBJECTIVES OF THE STUDY:

- 1) To investigate the effectiveness of oral –motor therapy and behavior therapy in the management of drooling.
- 2) To compare either approach for optimal control of drooling in children with CP.

METHODOLOGY:

A total number of 25 children with cerebral palsy associated with or without mild mental retardation attending outpatient occupational therapy department, SVNIRTAR were recruited for the study. Twelve cerebral palsy children were selected randomly in Group-A and 13 cerebral palsy children in Group-B. All the parents and caregivers of the patients were explained the purpose of the study and were requested to allow their child to participate in the study. Written consent was obtained from the parents for their child's participation in the study. Children diagnosed with CP and having drooling, age – more than 5 years of both gender and having mild mental retardation and head control were included in the study. Children those had other associated visual and hearing problem, cleft lip and cleft palate and those currently receiving any medications for drooling were excluded from the study.

At the initial visit each child was seated in a chair with trunk straight and engaged in an activity like peg lifting or making a tower. No towel or handkerchief was used to dry the oro-facial area in between. No attention was drawn to the child's swallowing and no comments regarding drooling were offered. Baseline frequency of drooling was observed by two independent raters for 20 minutes. The baseline frequency of drooling was the outcome measure used in the study.

A drooling episode was recorded when saliva spilled over the lower lip and fell out of the mouth. The numbers of drooling episode were totaled for 20 minutes. Inter rater reliability was calculated. After the baseline data collection patients in group-A received oral-motor therapy and patients in group-B received behavior therapy.

APPARATUS AND MATERIAL: In oral motor therapy the materials used were ice cube, tongue depressor, candle & match stick, straw and cup of water, measuring tape, gloves. The materials used in behaviour therapy were Token (Stars), Reinforcers (Sketch, Candy, Tatoes and Ball), Stop watch.

ORAL-MOTOR THERAPY:

Position of the patient: The child was seated in a chair with lap tray

with trunk straight.

TABLE-1
ORAL-MOTOR THERAY TREATMENT PROTOCOL

Sl. No	Activity	Frequency
1	Icing	1 cube
2	Stroking on gum Stroking on cheek	5 Strokes 5 Strokes
3	Pressure on tongue	1 beat / sec.
4	Candle blowing	15 attempts
5	Sucking water	1 minute

METHOD OF APPLICATION:

Icing: One cube of ice was given to the child and the child was asked to chew that. During this procedure the child was also told to swallow the water inside the mouth.

Stroking on Gums: Firm stroking was done with the tip of right index finger on outer upper gum which was followed by swallowing and the same was repeated on the lower gum.

Stroking on Cheek: Then downward bilateral strokes were applied to cheeks and around the lip.

Pressure on Tongue: Using tongue depressor, downward pressure was applied to midline of tongue, starting from tip of tongue to the back of tongue. As instrument reaches back of the tongue, the swallowing reflex is initiated and simultaneously the instrument is removed.

Candle Blowing: Blowing the candle kept at a distance where the child was asked to blow three times, if the child could blow at least once out of three trials that was considered as baseline distance. If the child was able to blow 15 times in one session and if successful in 4 consecutive sessions, then 1cm distance was increased from baseline. Sucking Water: Sucking water from a cup with a straw.

BEHAVIOR THERAPY:

Average time for a drool was calculated from the baseline average frequency of drooling. Subjects were motivated for keeping the mouth dry and not to drool for that specific time period.

Schedules of Getting Stars and Reinforcement:

During the session subjects were engaged in activities like making a tower, peg lifting. If the subject was able to keep the face dry and did not drool for that time period then one token and verbal reinforcement was given.

Same 4 repetitions in a single session was conducted. If 4 successful attempts – 4 tokens (stars) were given and they were exchanged by a reward of a ball etc. If the child gets 4 consecutive rewards in 4 sessions, then the duration of non drooling period was increased by ½ minute. Then again the same exercise repeated but now even for 4 successful attempts the subject will get 3 stars (for weaning from reinforcement) that can be exchanged for a reward. Again if successful in getting reward for 4 consecutive sessions, ½ minute increase in their non drooling behavior. Then again same exercise and 2 stars then one star and then no star in 4 successful attempts.

Both type of treatment were given 5 days a week for 20 sessions and then reassessment was done for frequency of drooling on 30th day of therapy. Treatments were discontinued for one week and again reassessment for frequency of drooling was done on 38th day for both the groups.

DATA ANALYSIS:

The independent t-test was used to compare the therapeutic results between the groups. The paired t-test was used for determining changes after the treatment within each group.

Differences were considered significant if the p-value was < 0.05. SPSS version 7.5 was used for all statistical analysis.

RESULTS: Baseline characteristics of all the participants are given in table No.2.

TABLE-2
Patient characteristics

Sl. NO.	Baseline Characteristics	Group-A	Group-B
1	No. of subjects	12	13
2	Age range (in years)	5 – 10 year	5 – 10.5 year
3	Mean age (SD)	6.942 (1.526)	6.915 (1.797)
4	Sex (Male/Female)	9/3	6/7
5	Type of CP (Diplepic / Quadriplegic)	9/3	8/5
6	Mean IQ (SD)	66.25 (10.03)	72.69 (12.18)
7	Baseline mean (SD) frequency of drooling	22.17 (8.09)	21.85 (5.71)

The statistical analysis used to find out the inter rater reliability i.e. to find out the correlation between the scores obtained by two independent raters was – Pearson product moment correlation coefficient. The result showed that there was consistent correlation between the scores of rater-1 and rater-2 during all the measurements in both groups as shown in table No.3

TABLE-3
Correlation between the Scores Obtained by Rater-1 & 2

Assessment on Day	r value	p value
Day – 0	0.969	0.000
Day – 30	0.967	0.000
Day – 38	0.959	0.001

Table -4 shows the mean pre therapy frequency of drooling on day 0 for the subjects in group-A is 22.17 and post therapy frequency of drooling on day 30 is 5.67. The result was analysed by using paired t-test and the result was found to be significant. (P = 0.001). The mean pre therapy frequency of drooling score on day 0 for the subjects in group-B is 21.85 and the post therapy frequency of drooling on day 30 is 3.38. The result was analysed by using paired t-test and the result was found to be significant (p = 0.001).

TABLE-4
Comparing the Mean Frequency of Drooling in Day-0 and Day-30 in Both Groups

Group	Mean Frequency of Drooling day- 0 (SD)	Mean Frequency of Drooling day-30 (SD)	t value	p value
A	22.17 (8.09)	5.67 (3.17)	9.397	0.001
B	21.85 (5.71)	3.38 (2.60)	12.946	0.001

The result of the above analysis shows that there is significant decrease in frequency of drooling after giving oral-motor therapy and behavior therapy.

Table No.5 depicts the mean score for the subjects in group-A is 14.42 and in group-B is 18.46. The results were analyzed using independent t-test and were found to be statistically not significant. The result suggests that there is no statistically significant difference found between oral motor therapy and behaviour therapy for reducing drooling in children with cerebral palsy. Thus both of the therapies are equally effective in controlling drooling.

TABLE-5
Comparing the Difference in Mean Frequency of Drooling On Day- 0 and Day 30 between Both Groups.

GROUP	N	MEAN	STD. DEVIATION	t. VALUE	p VALUE
A	12	14.42	5.48	1.903	0.070
B	13	18.46	5.14	1.898	0.071

Table No.6 depicts the mean frequency of drooling on day 30 is 5.67 and on day 38 it is 10.42 in group-A. To compare between the mean frequency drooling on day 30 and 38 paired t-test was used and the

result was found to be significant. The mean frequency of drooling on day 30 is 3.38 and on day 38 it is 7.69 in group-B. Between day 30 & 38 the scores were compared by using paired t-test and the result was found to be significant. ($P=0.000$).

TABLE-6
Comparing the Mean Frequency of Drooling in Day-30 and Day-38 in Both Groups

Group	Mean Frequency of Drooling day-30 (SD)	Mean Frequency of Drooling day-38 (SD)	t value	p value
A	5.67 (3.17)	10.42 (3.40)	9.610	0.000
B	3.38 (2.60)	7.69 (3.12)	7.551	0.000

The result of the above analysis suggests that there is an increase in the frequency of drooling after discontinuing oral-motor therapy and behavior therapy in both the groups.

DISCUSSION:

The result of this study shows statistically significant improvement after giving oral motor therapy in group-A. Thus oral motor therapy is effective in controlling drooling in CP children.

This result accords with those of Domaracki et al. 1990 who described that oral motor therapy is effective in reducing drooling but not eliminating it.

The decrease in frequency of drooling after therapy may be due to improved oral-motor control which was achieved by inhibition of hypertonicity in the oro-facial area after the application of ice which is also said to facilitate mouth closure and aid swallowing (Huss A.J. 1978). Stroking the cheeks symmetrically used in oral motor therapy also decreased lip retraction and thus lip closure improved which is important for the development of intraoral suction pressure used in swallowing (Lespargot et al 1993). The pressure applied to tongue also helped in increasing tongue mobility and promoting sucking pattern (Morris & Klein 1987).

The improvement shown after using behavioral therapy in group-B is found to be statistically significant ($p=0.000$) which showed that there is decrease in frequency of drooling after the therapy and thus behavior therapy (positive reinforcement) is effective in controlling drooling in cerebral palsy.

This result corroborates the findings of Garber 1971, Drabman et al. 1979 who described similar effects of positive reinforcement in controlling drooling in CP.

As children with CP who drool lack the conscious and voluntary transport of saliva to the back of mouth which is necessary to produce a reflexive swallow (Edehahl et al. 1978), behavior therapy aimed at bringing swallowing to a cognitive level (Koheil et al. 1989). Positive reinforcement increases the memory link in the chain of swallowing behavior. Thus increasing the probability of the behavior happening again.

This improvement after therapy may also be attributed to the development of voluntary mouth closure rather than the more normal subconscious automatic process of swallowing (Immateo et al. 1990). The comparison between oral motor therapy and behavior therapy in controlling drooling was found to be statistically insignificant ($p=0.070$) i.e. both the therapies are equally effective in controlling drooling in CP. But clinically it was found that behavior therapy is marginally more effective than oral motor therapy in controlling drooling. This may be due to the reason that the therapy session for oral motor therapy and behavior therapy was once in a day. But the children were also getting reinforcement from the parents and caregivers for the non-drooling behavior throughout the day.

The reduction in frequency of drooling in both the groups could not be sustained, as seen in the recording after one week that probably be due to the following reasons.

- Oral motor stimulation treatment did not change neural structures, because change in frequency of drooling varied with the introduction and removal of therapy (Domaracki et al. 1990).

- The learning period was too short in behavior therapy.

Although the scores of drooling frequency increased in both the groups after one week of discontinuing treatment, the scores did not reach the pre treatment level. Thus the carryover effect was seen after discontinuation of therapy in both the groups, which was also found in the earlier studies done by Garber, 1971 and Dunn et al. 1987.

While giving behavior therapy it was seen that some children drool more when candy was used as a reinforcer. So it was discontinued and another reinforcement like colour pencil was given.

Despite reported success, behavior therapy remains unpopular because it is labor intensive and because a certain level of intelligence is required for cooperation. More over repeated training is often required for reinforcement.

CONCLUSION:

Drooling can be a significant problem in children with neurologic dysfunction. The result of the study demonstrated that oral-motor therapy and behavior therapy are equally effective in controlling drooling in cerebral palsy. After the discontinuation of therapy in both the groups drooling frequency was seen to be increased but it did not reach the pre-treatment level, which shows that though drooling returned, it returned at a lesser frequency. The study was conducted on a small sample size and the follow up period was less, so long term effect could not be studied

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