Pilot Study of Oro-motor Habilitation Program for Children with Drooling Problem: A Pilot Observation

R. To, V. Wong, Y. Hui, W. Goh, A. Yung, C. Lee, P. Sit

Abstract
A pilot project for children who attended the Drooling Clinic at the Children's Habilitation Institute of the Duchess of Kent Children's Hospital was conducted. The aim was to investigate the effectiveness of the Oro-motor Habilitation Program in reducing drooling. The Program consisted of oro-motor function training, behavioral modification program, motor control training, the use of oral appliances and surgical treatment. The study group consisted of 12 children with varying degrees of drooling problem, cerebral palsy and mental retardation (N=7) and mental deficiency (N=5). Visual analogue scale and Drooling Quotient (DQ) were used to measure the severity of drooling before and after the Oro-motor Habilitation Program. Improvement occurred in 75% of children after receiving the Oro-motor Rehabilitation Program for 6 months, 86% for cerebral palsy, 60% for mental deficiency. We propose to provide a trial of Oro-motor Habilitation Program before embarking on surgical treatment of drooling.

Key words
Oro-motor Habilitation Program; Visual Analogue Scale; Drooling Quotient; Multi-disciplinary; Children

Introduction
Drooling is normal in infants and it will subside by the age of 18 months.1 However, drooling is common in populations with mental retardation or cerebral palsy beyond this age and may even persist to adult life.2

Subjects and Methods
The study group consisted of 12 children (8 boys, 4 girls) with varying degrees of drooling, currently followed
up in the Drooling Clinic of the Duchess of Kent Children's Hospital. Their age ranged from 4 to 18 years (mean age = 7.1 years.) Seven children had cerebral palsy and mental deficiency and 5 had mental deficiency.

The treatment program consisted of (1) behavioral modification program conducted by speech therapist to reinforce good lip closure, (2) motor control programs conducted by occupational therapist aiming at improving postural muscle tone control, (3) oro-motor training conducted both by speech therapist and occupational therapist including normalizing the muscle tone of lips, cheeks and tongue together with developing good lip, tongue and jaw control (4) Oral appliances such as complete lip closure detector which will facilitate sensory awareness of lip closure (5) surgical treatment by otolaryngologist.

All children were given oro-motor training and behavioral modification program for a period of 6 months on a biweekly basis. Home training was carried out by the caregivers for 5 minutes twice a day, 5 days/week.

Oro-motor training aimed to improve tongue position and mobility, lip closure, jaw position and stability. It consisted of brushing, vibration and icing. Vibration was applied to the masseter, the anterior digastric muscles and the upper lip for two minutes in each area. Other manipulating techniques such as stroking, patting and tapping were applied on both the upper and lower lips to improve normal movement pattern.

Cerebral palsy children who drooled had more trouble in initiating swallowing than normal children or cerebral palsy who did not drool. Drooling may be related to infrequent swallowing, inadequate lip closure and poor head posture. Our subjects were encouraged to have frequent swallowing. A mirror was used as a visual aid to give feedback to increase swallowing frequency. Different combinations of verbal cueing and positive reinforcement were also used. In order to decrease habitual open mouth posture, patients were rewarded with food when they kept the lips closed over one minute, which was gradually increased to longer period of time as the patient's ability to control drooling improved.

Positional and oro-motor functional problems predispose to drooling, thus treatment to improve body position and posture are important in the management of

<table>
<thead>
<tr>
<th>Case</th>
<th>Sex</th>
<th>Age</th>
<th>Diagnosis</th>
<th>Head control</th>
<th>Communication</th>
<th>Facial tone</th>
<th>Ability to close lip</th>
<th>Habitual mouth closure</th>
<th>Training sessions</th>
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<td>Non-verbal</td>
<td>Hypotonic</td>
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MR - mental retardation
CP - cerebral palsy
drooling. Seven cerebral palsy children were also given 
motor control program. They were positioned in a way 
that their shoulder girdle, trunk, and pelvis were stable 
and the back of the neck was straight with the chin slightly 
tuck. Since stability is pre-requisite for mobility, oro-motor 
training could be further facilitated through an increase in 
head and trunk stability.

Only 2 children (Cases 3 and 10) with mild mental 
retardation had the ability to follow verbal commands. 
They were given oral appliance of the complete lip closure 
detector. This was a device that consisted of a lip electrode 
connected to an electronic control unit. The lip sensor was 
hooked onto the lower lip. When the lip seal was broken, 
a continuous beep was activated. It was developed as a lip 
seal reminder to assist the children in improving lip closure.

**Measurement of Drooling**

Drooling was measured by two validated techniques: 
(1) Visual Analogue Scale which is a questionnaire-based 
scoring system for severity of drooling and (2) Direct semi- 
quantitative observation (i.e. Drooling Quotient).

The Visual Analogue Scale was used to measure the 
severity of drooling before and after Oro-motor 
Habilitation Program. The scale was a 10 cm line with the 
marking of 'Normal' at one end, and 'Extremely wet' at 
the other end. The severity of drooling was assessed 
visually by the caretaker and represented by a mark along 
the visual analogue scale. The lowest score was zero which 
meant that the child never drooled. The highest score was 
10, which meant that the child had severe drooling.

![Visual Analogue Scale](image)

A visual analogue scale is 10 cm in length

During the reassessment after treatment, the same 
caretaker rated the severity of drooling without referring 
to the previous score. Successful treatment outcome was 
defined as any negative change (i.e. decrease in score) in 
the visual analog scale.

An objective measurement was also used to document 
the degree of improvement by a using the Drooling 
Quotient. Drooling was observed and scored during two 
periods of 10 minutes separated by a 30-minutes break.
The presence or absence of drooling was evaluated at every 
15-seconds interval over a 10-minutes period (40 
observations) while the patients were awake and sitting 
erect. An episode of drooling was defined as new saliva 
leaving the chin. The drooling quotient, expressed as a 
percentage, was calculated as the number of drooling 
episodes in 10 minute divided by 40 (the number of 
observations).

During the initial assessment, drooling quotient was 
obtained on two occasions by the speech therapist and a 
mean value was calculated as a baseline measure. 
Treatment was provided regularly on a biweekly basis for 
6 months. The patients were reassessed after treatment. 
Successful treatment outcome was defined as any negative 
change (i.e. a decrease in Drooling Quotient).

\[
\text{Drooling Quotient (DQ) } \% = \frac{\text{no.of drooling episodes}}{40 \text{ observations}} \times 100\%
\]

\[
\text{in a 10 minute period}
\]

**Results**

Pre- and post-treatment data were analysed using 
Wilcoxon matched-pairs signed-rank analysis. This 
showed an improvement in both the median drooling 
severity, from 6.3 (pre-treatment measure) to 4.8 (post- 
treatment) in the Visual Analogue Scale (p<0.05) (Figure 
1); from 32.5% (pre-treatment assessment) to 20% (post- 
treatment assessment) in the Drooling Quotient (p<0.05) 
(Figure 2).

**Discussion**

The control of drooling is difficult as the problem is

![Figure 1](image)

Diamonds represent the pre-treatment performance and squares 
represent the post-treatment performance.

**Figure 1** Visual Analogue Scale. Pre- and Post-treatment 
Performance on Measure of Drooling Severity rated by the same 
care-taker using the Visual Analogue Scale.
Patient 4 showed increased in drooling after 6-month therapy. One of the factors contributing to the increase in drooling may be related to her frequent episodes of seizure during the training period and she was put on anti-convulsion medications.

Various success rates are found in 9 children and it is not possible to conclude which method of treatment is the best. However, children's awareness of drooling and the ability to swallow on command seemed to be the factors affecting the treatment outcome of the behavioral program and the use of oral appliances. For children who were not able to follow any verbal instructions or imitate oral movement, oro-motor program seemed to work better for them.

Our results show improvement in drooling, indicating that treatment oro-motor therapy and behavioral therapy may be worth trying even in more severe cases with saliva control problems. However, children's awareness of drooling, the ability to swallow on command seemed to be other factors affecting the treatment outcome of the behavioral program.

These results are the broad brushstrokes that encourage more specific investigation into drooling in disabled children. Our study has limitations, mainly the short duration of therapy, the lack of standardization of other therapy, and the nonblind study design.

Larger sample size and grouping of patients into more homogeneous groups, as well as control studies would be necessary to evaluate the different treatment methods in different patient groups. The initial results are encouraging and may be useful in designing a long-term control study. We believe that a period of quality Oro-motor Habilitation Program is essential before contemplating surgical treatment and multidisciplinary approach can enable refinement of assessment techniques and different treatment strategies.

**Acknowledgment**

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**References**

3. Makhani JS: Dribbling of saliva in children with cerebral palsy...