

Drooling in Disabled Children Evaluation and Management

Özürli Çocuklarda Salya Akması Değerlendirme ve Tedavi

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ABSTRACT

In addition to locomotor system's deficits many children with neurological disorders and mental retardation such as cerebral palsy and Down Syndrome suffer from chronic drooling which can be seen in 10% to 38% of people with cerebral palsy and in certain patients with Down Syndrome (1,2). Drooling leads to many problems which can affect the patient's health and parent's social life as well as it keeps the patient away from training and rehabilitation programs.

Some procedures such as behavior modification, biofeedback, oral motor therapy, speech therapy, drug therapy, radiotherapy, oro-facial regulation therapy, and surgery have been suggested to treat drooling. This review deals with the possible methods of evaluation and treatment of drooling in disabled children.

Keywords: *Disabled child, Cerebral palsy, Down syndrome, Drooling*

ÖZET

Serebral palsi ve Down Sendromunda olduğu gibi nörolojik hastalığı ve mental retardasyonu olan bir çok çocuk lokomotor sistem bozukluklarına ek olarak kronik salya akmasından dolayı ızdırap çekmektedir. Bu sorun serebral palsi'li hastalarda %10 ile %38 arasında olup Down Sendrom'lu hastaların da bazılarında görülmektedir (1,2). Salya akması hastanın sağlığı, ebeveynlerin sosyal yaşantısını etkileyen bir olgudur ve bir çok sorunlara yol açmaktadır. Bu sorun çocuğun eğitimden ve rehabilitasyon programlarından uzak kalmasına yol açar.

Davranışsal modifikasyon, biofeedback, oral motor tedavi, konuşma tedavisi, ilaç tedavisi, radyoterapi, oro-fasial regülasyon tedavi ve cerrahi gibi bazı

yöntemler salya akmasının tedavisi için önerilmiştir. Bu derleme özürlü çocuklarda salya akmasıyla ilgili mümkün olan değerlendirme ve tedavi yöntemlerini ele almaktadır.

Anahtar Kelimeler: Özürlü çocuk, Serebral Palsi, Down sendromu, Salya

INTRODUCTION

Drooling or sialorrhoea is defined as the anterior salivary flow from the mouth. It is a normal state in infants and it decreases within 15-18 months as the development of oral motor and sensor functions continue (3).

Diseases that affect the followings below:

- a- oral motor function
- b- coordination of related muscles
- c- muscles tone
- d- erect posture

may contribute to drooling problem and the salivary flow seems as an important clinical problem. Salivary secretions are produced by salivary glands; parotid, sublingual, buccal, and submandibular glands. The total amount of daily saliva production in adult is about 0,05-1.5 liters. However, this amount depends on many factors and from person to person it may show large variations. Moreover, characters of secretions from different glands are variable. In rest state 70% of the saliva is secreted by the sublingual and submandibular glands with high viscosity. 20-25% is less viscous and secreted by the parotid gland. A remaining small amount is secreted by the mucosal and palatal glands. While the sublingual and submandibular glands function with fixed rate, parotid gland secretions are increased with eating. Saliva secretion is under the control of the parasympathetic nervous system (1,3). Drooling is unhygienic condition in which spread of secretions and pathogens may lead to infectious transmission and medical problems for disabled people as well as it affects the family's psychosocial life and

creates a great worrisome trouble for them. It is a problem that leads to social isolation and may impair articulation, restricts objects placement and vocational options and causes loss of self esteem especially for those of normal intelligence. Skin irritation and dehydration may also occur (4). The flow of saliva sometimes may keep away disabled children from the therapeutic and skills training programs thus normal therapeutic procedures and treatment are affected. Frequent change of clothes can be embarrassing for parents and caregivers. When clothes and surfaces around become wet due to excessive salivary flow, that means the problem is serious and requires an intervention (1,3,5).

Drooling may occur as a result of neurological disorders such as cerebral palsy, Down Syndrome or mental retardation. Salivary flow is seen in about 10 to 38% of patients with cerebral palsy (2) and in significant number of children with Down Syndrome (1).

Some of probable causes of drooling in disabled children are:

Causes Due to Oral Motor Dysfunctions

- Reduced ability to voluntarily control of the lips, jaw, tongue and throat muscles.
- Inadequate lip closure and sucking ability.
- Difficulties in chewing and swallowing ability.
- Dental malocclusion.
- Reduced intraoral sensitivity and inadequate sensory awareness.
- Inadequate frequency of spontaneous swallowing.
- Abnormalities in esophageal stage.

-Poor coordination of orbicularis oris and masseter activity.

Causes Due to the Neurological Disease

-Poor head and trunk control.

-Difficulties in maintaining erect posture.

-Severity of mental and physical retardation and concentration level.

-Abnormal muscles tone.

-Emotional states (1,2,3,5,6).

Senner et al (2) demonstrated that the drooling severity has positive correlation with the severity of dysarthria and the drooling in patients with cerebral palsy is related to swallowing difficulties rather than hypersalivation. Tahmassebi et al investigated whether or not drooling in children with cerebral palsy is due to hypersalivation. The study population consisted of 10 children with cerebral palsy who were identified as having severe drooling, and a control group composed of 10 unaffected children who had no known physical or mental disabilities. Salivary flow rate was compared between the cerebral palsied children and the control group. There was no statistically significant difference in the rate of salivary flow between the two groups. According to them children with cerebral palsy who drool do not appear to produce excessive saliva. Their salivation is similar to the control children (7).

EVALUATION OF DROOLING

In relation to many factors such as posture, emotional states and degree of retardation, drooling in the same person shows certain differences in its amount during the day so this variation may restrict the clinical evaluation of drooling and make it difficult. Despite the disadvantages, there are several procedures used to evaluate drooling:

Drooling Quotient

- The drooling episode which defines as a new saliva present on the lip margin or dropping from the chin is the main component of this method.

- Recording the frequency of drooling episodes during certain time, expresses the severity of drooling.

- In its original procedure drooling quotient was recorded during 20 minute divided to two equal periods by one hour interval.

- By making one observation every 15 second the drooling episodes in the total 40 observations in each 10 minute was recorded.

- Presence or absence of drooling was assessed.

- Subjects were evaluated at least one hour after meal while awake and in erect sitting position during different activities.

- The percentage of drooling quotient was expressed using the the ratio of observed drooling episodes and total observation numbers $(100 \times \text{number of drooling episodes} / 40)$ (8).

Saxon Test

- Saxon test was used to measure the quantity of saliva production by a guaze (guaze is a thin, transparent fabric with a loose open weave) – chewing procedure.

- A steril piece of guaze in different sizes (10.16cm x 10.16cm or 7.62cm x 7.62cm -according to the size of oral cavity or subject's age) is folded twice at 90 degree and placed in a plastic container.

- The guaze and plastic container are weighed.

- Subjects are asked to swallow to remove any preexisting oral fluid.

- The oral cavity of the subjects suctioned using oral suction unit with a portable system.
- Subjects are asked to chew on the gauze for one minute.
- To prevent the gauze aspiration, the gauze is held by dental floss.
- After chewing procedure the, gauze and container are weighed again.
- The amount of saliva produced is determined by subtracting the original weigh from the waigh obtained after chewing.
- Additional pre-weighed dental towel is used for each subject to catch any loss of saliva flowing out the mouth and the weigh is added to the procedure (2).

Teacher Drooling Scale (TDS)

- The TDS is used to assess the severity of drooling by making interview with the parents or related persons.
- This method is used during outpatient visits.
- 1 to 5 scores are used.
 - (1) No drooling
 - (2) Infrequent drooling; small amount
 - (3) Occasional drooling; intermittent all day
 - (4) Frequent drooling but not profuse
 - (5) Constant drooling; always wet (4,8).

Visual Analog Scales (VAS)

- A scale of 10 cm is filled out by the parents or related person.
- A specific instructions are given before the procedures.
- This method is used in home situation.
- A mark at the left end represents severe drooling while a mark at the right end shows no drooling.

- VAS may be scored with a ruler to make ranging from 0 to 100 (8).

MANAGEMENT OF DROOLING

To overcome the drooling first some important points should be noted. Due to the effects of gravity, the down position of the head increases the flow so this position must be prevented. Maintaining the erect position not only effective for decreasing drooling but it is also important for inhibition the abnormal postural reflexes in neurological diseases such as cerebral palsy. Some important dental disease also should be treated. Assessments about the serious malocclusions and problems related to mouth closure should be made and if necessary, intervention should be made by experts. If conditions such as adenoidal tissue and anatomic variations that causes nasal air occlusion are present therefore patients should be referred to ear, nose and throat specialist. It is important to know that medications which are used for the treatment of epilepsy and similar drugs affect the flow of saliva (1). The treatment procedure of salivary flow includes oro-motor exercises, behavioral modifications, speech therapy, drug therapy, surgery, oro-facial regulation therapy and biofeedback.

Exercises for oro-facial area and speech therapy are important procedures for decreasing drooling (9). Auditory EMG feedback training programs of orbicularis and infrahyoid muscles may lead to some decrease in salivary flow and a small increase in swallowing. In an attempt to decrease the rates of drooling of 12 children with cerebral palsy, Koheil et al. (10) investigated the effectiveness of EMG auditory feedback training of the orbicularis oris, of making the act of swallowing a conscious one, and of providing an auditory signal to cue swallowing every 30-40 seconds. After biofeedback training there was a significant decrease in drooling rates and a small increase in swallowing rates. Specific exercise programs including

sensory motor techniques to stimulate movement and decrease the thrust of tongue, to obtain and maintain the closure position of the lips and to facilitate swallowing are recommended. It has been noted that subjective improvements are seen in drooling frequency by applying vibrations to the masseter, the anterior digestrics and the upper lip for 2-3 minutes in each area (3,11).

Neuromuscular electrical stimulation is used to increase facial muscle movements and to improve poor oral-motor control. Cole (12) stimulated the orbicularis oris, masseter, depressor anguli oris, depressor labii inferioris, risorius/buccinator and mentalis muscles with low voltage pulsed galvanic current with a one-second "on" and one-second "off" held on each muscle for approximately 10 seconds twice a week. Neuromuscular electrical stimulation was performed on both sides of the face for approximately five minutes, followed by vibrotactile stimulation. Oral-motor stretching exercises also were performed. Researchers observed improvements in facial muscle movements and oral-motor control after the treatment of the patient who was diagnosed as Moebius Syndrome.

Proprioceptive neuromuscular facilitation (PNF) technique is used to restore and retrain muscle function. This technique inhibits abnormal muscles tones and facilitates the normal motor movements as well as it provides improvement in facial expression and aesthetic. A series of PNF exercises with resisted movement to motions such as lifting the upper lip, lowering the lower lip, and sticking out the tongue was performed three times per day for 1 month to the perioral muscles to provide improvement in facial aesthetics after orthodontic treatment. This technique appeared to be effective for sharpening the mouth and submandibular region, and might be useful for helping the perioral muscles adapt to alterations in the hard tissues and improving the facial expression and aesthetic (13).

Oro-facial regulation therapy can stimulate the intra-oral and circumference musculature using standard acrylic base plates with acrylic buttons and beads. In cases such as Down Syndrome a hypotonic oral musculature and tongue protrusion are present. It has been reported that this tool stimulated the retrusive position of the tongue and lip seal formation, reduced the oro-facial hypotonic symptoms and improved the oral function and expression (Fig. 1) (1,14,15,16). In some cases some modification may be introduced to the system as a compensatory mechanism for any missing in the intra-oral area. When suitable modifications are made to appliances like this type and by the combination with physiotherapy methods the effectiveness of treatment may be increased and thus the salivary flow decreases in disabled children with severe drooling.

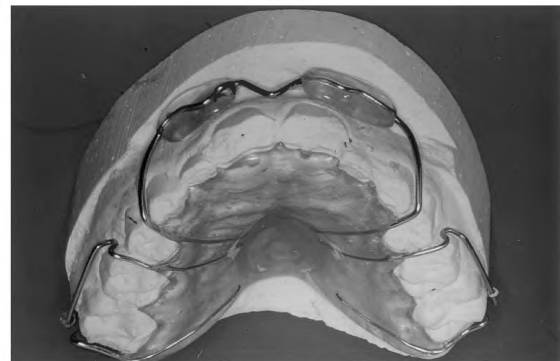


Figure 1. A palatal acrylic appliance with accessory buttons. *Journal of Oral Rehabilitation* Vol. 27,9 Pages: 735-743

Radiotherapy, using in excess of 600 rads, has been advocated for the treatment of drooling. The dose varies from person to person, however using this type of treatment may cause complications such as sarcomas, osteoradionecrosis and dental caries. In addition to the methods described above medical and surgical treatment is used in drooling management (1). Conservative treatments as well as

surgical procedures all have their limitations. However recent reports suggest a therapy that uses botulinum neurotoxin injections. (BoNT) injections are used into the salivary glands as an option for treatment of drooling (8). Ellies et al (17) studied a larger population and concluded that the BoNT effect lasted for 2 to 3 months.

CONCLUSION

The conclusion from these studies appear to be that disabled children with drooling differ from normal children in their oro-motor control and swallowing activity as well as utilizing an inefficient and uncoordinated oro-facial muscles. These findings show that the use of behavioral modification, physiotherapy and speech therapy treatment methods increase swallowing frequency. The oral motor therapy also facilitates lips closure and provides coordinated swallowing.

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