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Original Research Article

A Study of Efficacy of Botulinum Toxin Type A in Treatment of Hyper salivation

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Abstract: Hyper salivation or drooling is unintentional loss of saliva from the mouth, seen usually in patients with neurological deficits such as cerebral palsy, motor neuron disease or Parkinson's disease. Persistent drooling may cause problems in social development of patients, as well as problems related to personal hygiene. Many studies have investigated the clinical improvement in drooling after the injection of botulinum toxin type A (BTXA). Our present study was performed in cerebral palsy patients in whom we followed a simplified procedure of Injecting Botulinum toxin in children of cerebral palsy at lower doses than other study. USG studies were not carried out and injections were given based on anatomy and palpation of the gland which is superficial. Fourteen cerebral palsy patients (6-15 years-of-age; mean 08yrs, 08 boys and 06 girls) were injected with 0.5 units/kg body weight of Botulinum Toxin Type A in each parotid. Three injections with an insulin syringe were given in each parotid. Children were followed up weekly for first four weeks and thereafter monthly. Twelve children out of fourteen showed improvement following BTXA injections, thus demonstrating that Botulinum Toxin Type A injection is an effective treatment of hyper salivation.
Keywords: Hyper salivation, Drooling, Botulinum Toxin.

INTRODUCTION

Saliva is produced in and secreted from the salivary glands in the body and functions to initiate digestion. The secretion of saliva is under the control of the autonomic nervous system. Hyper salivation (drooling) is unintentional loss of saliva from the mouth due to immature or damaged oral motor skills. While drooling is normal in young children, it is considered abnormal beyond the age of four years [1]. It occurs more frequently in patients with neurological deficits such as cerebral palsy, motor neuron disease or Parkinson's disease. Drooling can lead to functional and clinical consequences for patients, families, and caregivers. Physical and psychosocial complication includes maceration of skin around the mouth, secondary bacterial infection; bad odour, dehydration and social stigmatization [2]. People with drooling problems are also at increased risk of inhaling saliva, food, or fluids into the lungs especially when body's normal reflex mechanisms, such as gagging and coughing are also impaired.

The treatment options include anti-cholinergic drugs and surgical intervention but these modalities of treatment are not without significant side effects [3]. Many studies have investigated the clinical improvement in drooling after the injection of botulinum toxin type A (BTXA) [4, 5]. In one study, BTXA was injected into rat salivary glands and the resulting change in structure and function was monitored. Another study reported salivary gland shrinkage following the injection of BTXA into rat salivary glands [6].

There have been small studies in which botulinum toxin has been injected in parotid and submandibular glands in human subjects, all have been under USG guidance and dosage of Botulinum toxin has been used between 1-2 units/kg/gland [7]. Our present study was performed in cerebral palsy patients in whom we followed a simplified procedure of Injecting Botulinum toxin in children of cerebral palsy at lower doses than other study. USG studies were not carried out and injections were given based on anatomy and palpation of the gland which is superficial.

AIM

To investigate the effect of botulinum toxin type A (BTXA) on hyper salivation (drooling) in patients with cerebral palsy.

MATERIAL AND METHOD

Subjects

From Oct 2011 to July 2012, fourteen cerebral palsy patients (6-15 years-of-age; mean 08yrs; 08 boys and 06 girls) presented to our hospital for treatment of drooling. Eight patients had spastic tetraplegia and six patients had spastic hemiplegia. According to the Gross Motor Function Classification System (GMFCS), three were rated as level 1 and the remaining eleven as level 5.

Table 1-Degrees of the Teacher Drooling Scale [8]

Degree	Description
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

Table-2: Distribution of Degrees of the Teacher Drooling

Degree	No. of Children
3	10
4	4
5	2

Ten children were degree 3; four were degree 4 and two were degree 5

All children were injected with 0.5 units/kg body weight of Botulinum Toxin Type A in each parotid. Three injections with an insulin syringe were given in each parotid. Children were followed up weekly for first four weeks and thereafter monthly.

RESULTS

Six children improved from degree 3 to degree 1, two children moved from degree 3 to degree 2, two children had no benefit & remained at degree 3. Of the four children at degree 04 two improved to degree 2 and two improved to degree three, both degree 5 children improved to degree 3.

Table-3: Degrees of the Teacher Drooling Scale before and after injection of botulinum toxin type A (BTXA).

No of Children	Previous Degree	New Degree
6	**3**	**1**
2	**3**	**2**
2	**3**	**3**
2	**4**	**2**
2	**4**	**3**
2	**5**	**3**

All children except two had some improvement. Some had moderate improvement and some better.

DISCUSSION

In special education schools, the reports are that 58% of children with cerebral palsy displayed drooling and 33% of them displayed severe drooling [5] Eke Dahl demonstrated that about 10% of children with cerebral palsy has severe drooling.

Among the many treatment methods developed for drooling, anti-cholinergic agents such as Benzotropine, Glycopyyrolate, and Benzhexol Hydrochloride are effective. However, these agents can produce various adverse events such as report that drooling orthostatic hypotension, bradycardia, urinary retention, constipation, and diarrhea. Drooling can also be surgically treated by changing the direction of the secretory duct of parotid glands and removing the salivary glands. However, this might bring about complications such as dysphagia, airway stenosis, and xerostomia.

The collective results have led to the view that BTXA injection is an effective treatment for improving drooling without significant adverse events compared to existing methods such as the use of anti-cholinergic agents or surgery [9].

Salivary secretion is regulated by the autonomic nervous system; the sympathetic system primarily controls composition of saliva while the parasympathetic system regulates the secretion amount. As acetylcholine is secreted at the terminals of parasympathetic nerve fibers, saliva is produced.

When BTXA reaches the target tissue, it is internalized via endocytosis into the nerve cells at the axon terminal, where it binds to the soluble N-ETHYLMALEIMIDE-SENSITIVE FACTOR ATTACHMENT PROTEINRECEPTOR (SNARE) protein complex, which contributes to release of acetylcholine, resulting in proteolytic cleavage of the SNARE protein complex [10].

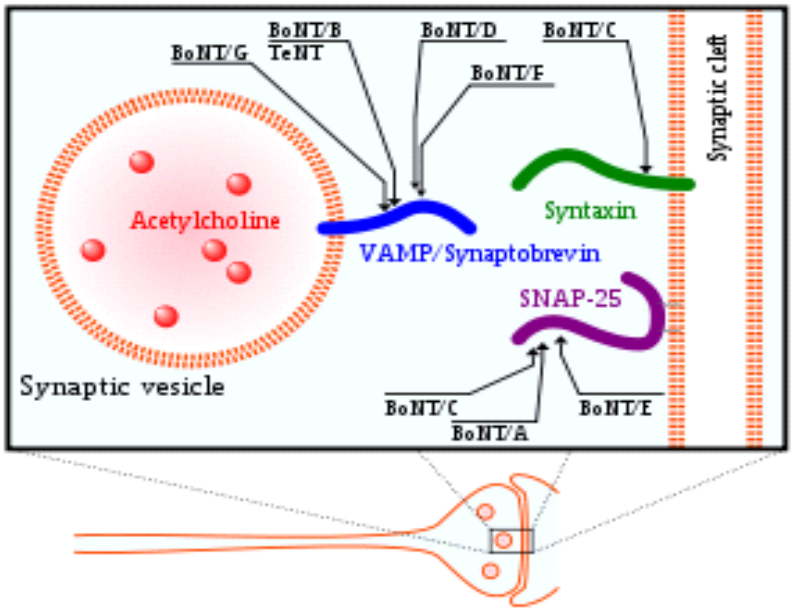

Fig-1:Target Snare Proteins Of Botulinum Toxin (Bont) [11, 12]

CONCLUSION

Botulinum toxin injections are becoming increasingly common. Injection of Botulinum toxin into the salivary glands is an effective therapy for many children. Their benefit is temporary and they usually need to be repeated every 3 to 6 months. Children suffering from hyper salivation are often shunned socially for the unhygeinic drooling besides their clothes getting wet and unsightly.

In our study BTXA was injected into the salivary glands in patients with cerebral palsy having severe drooling, demonstrating significant clinical improvement in drooling and improved functional and social outcomes.

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