
Neuromuscular electrical stimulation for sialorrhea in an elderly person with cerebral infarction

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Abstract

Sialorrhea is prevalent among patients with oromotor control and autonomic dysfunction. When the elderly have excessive saliva secretion, it is often caused by cerebrovascular disorders such as cerebral infarction and nervous system disorders such as Parkinson's disease. A cerebral infarction patient receiving home treatment complained of sialorrhea. We report an 81-year-old male patient with cerebral infarction receiving home treatment who developed sialorrhea. We used neuromuscular electrical stimulation (NMES) as an effective rehabilitation administered at home. The NMES unit was set to stimulate the orbicularis and masseter muscles. We performed training with NMES on the paralyzed side for 30 min per day. Evaluations were conducted at baseline and at 7, 14, and 28 d. The Drooling Rating Scale was used to evaluate severity and frequency of drooling. The Drooling Severity and Frequency Scale (DSFS) was also used to evaluate the patient; the DSFS score equals the sum of the severity and frequency subscores. There were no particularly noticeable complications, and the course was good. There was some discomfort with stimulation, but discomfort disappeared within 1 week. Sialorrhea improved, but it did not completely disappear at 28 d. There were no substantial changes in facial features following rehabilitation.

Introduction

Sialorrhea is prevalent among patients with oromotor control and autonomic dysfunction. When the elderly have excessive saliva secretion, it is often caused by cerebrovascular disorders such as cerebral infarction and nervous system disorders such as Parkinson's disease. Sialorrhea often appears on the paralyzed side after cerebral infarction; 70%–78% of patients with Parkinson's disease exhibit sialorrhea ¹⁾⁻⁴⁾. Sialorrhea greatly affects a patient's quality of life ^{2) 5)}. Not only does this condition result in patient discomfort, but spillage of saliva can lead to aspiration and infection ⁶⁾.

Typical treatments have included various drugs and/or oral rehabilitation therapy. In recent years, NMES, a type of electrical muscle stimulation, has been widely used in the field of rehabilitation, including the orofacial region. NMES involves direct stimulation of muscles to recruit motor units and increase muscle strength.

A meta-analysis of seven trials found a small but significant improvement in overall swallowing ⁷⁾. This result indicated that NMES might be effective for disordered movement of the head region.

A cerebral infarction patient receiving home treatment complained of sialorrhea. We considered that NMES may be an effective rehabilitation treatment that could be administered in home care.

Case Presentation

The patient was an 81-year-old male. He had a history of diabetes mellitus type 2, dialysis due to decreased renal function, hypertension, and cerebral infarction. The patient had left-side paralysis caused by the cerebral infarction and was confined to a wheelchair. Sialorrhea developed after the cerebral infarction and had affected the patient for approximately 5 years.

The patient had been receiving oral rehabilitation in the form of swallowing training. However, the patient was unable to undergo rehabilitation for long periods because of fatigue,

and continuous oral rehabilitation could not be achieved. He had never been treated for sialorrhea. The patient requested that dental treatment, including oral care, be administered in the home.

Evaluations were conducted at baseline and at 7, 14, and 28 day. The Drooling Rating Scale (DRS) was used to evaluate severity and frequency of drooling (table 1)^{8) 9)}. The patient was unable to stand, so we did not evaluate the standing category.

Table 1 Score is sum of subscores for each activity (maximum = 15) .

Drooling Rating Scale (DRS)

Type of activity	Excessive dryness of the mouth (score = 0)	No excess of saliva (score = 0)	Excess of saliva in mouth without drooling (score = 1)	Mild to moderate drooling, needs occasional wiping (score = 2)	Continuous drooling, wet clothing or constant use of handkerchief or tissue (score = 3)
Sitting					
Standing					
In bed					
Talking					
Eating & drinking					

The Drooling Severity and Frequency Scale (DSFS) was also used to evaluate the patient; the DSFS score equals the sum of the severity

and frequency subscores (table 2)¹⁰⁾. Baseline scores ranked the patient as having severe sialorrhea (table 3) .

Table 2 The Drooling Score equals the sum of the severity and frequency subscores.

<u>Drooling Severity and Frequency Scale (DSFS)</u>
<p>Drooling Severity Scale</p> <p>1 = Never drools, dry</p> <p>2 = Mild-drooling, only lips wet</p> <p>3 = Moderate- drool reaches the lips and chin</p> <p>4 = Severe- drool drips off chin & onto clothing</p> <p>5 = Profuse- drooling off the body and onto objects (furniture, books)</p>
<p>Drooling Frequency Scale</p> <p>1 = No drooling</p> <p>2 = Occasionally drools</p> <p>3 = Frequently drools</p> <p>4 = Constant drooling</p>

Table 3 Evaluation was conducted at baseline, after 7 days, 14 days, and 28 days.

Date	DRS						DSFS	
	Sitting	Standing	In bed	Talking	Eating & drinking	Total	Severity	Frequency
0 day	3	-	3	3	3	12	5	4
7 day	3	-	3	3	3	12	5	4
14 day	2	-	2	2	2	8	3	3
28 day	1	-	1	2	1	5	2	2

The NMES unit (ExcareDi; Excare Japan, Tokyo, Japan) was set to stimulate the orbicularis and masseter muscles (figure 1). We performed training with NMES on the paralyzed side for 30 min per day. No other rehabilitation was performed in the facial area during rehabilitation with NMES. The NMES stimulus was compound corrugation with composite high frequency of 6-9 mA. There were no particularly noticeable complications, and the course was good. Ratings improved from severe sialorrhea at baseline to sialorrhea at both resting and moving at 14 days. There was some discomfort with stimulation, but discomfort disappeared in 1 week. Sialorrhea was improved, however did not completely disappear at 28 d. There were no substantial changes in facial features following rehabilitation (figure 2).

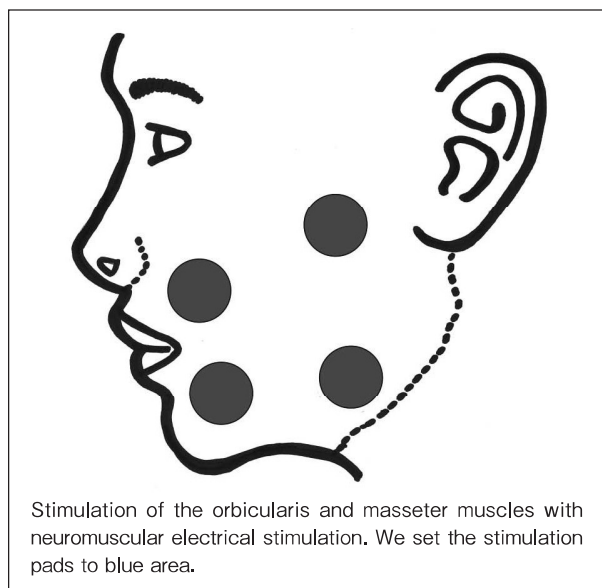


Figure 1

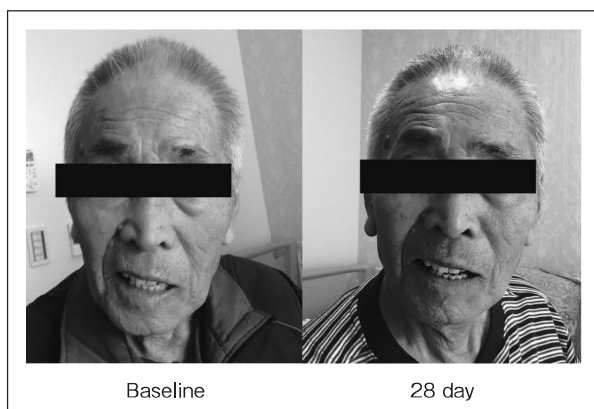


Figure 2 Facial photos at baseline and 28 day.

Discussion

There are various treatments for sialorrhea. Oral anticholinergic drugs that block parasympathetic pathways to the salivary gland and inhibit saliva production are often used to treat sialorrhea^{11) 12)}. Oral anticholinergic drugs include oral hyoscyamine and amitriptyline, sublingual ipratropium bromide and sublingual atropine, and tropicamide¹³⁾. These systemic agents are frequently associated with side effects that include cognitive impairment, drowsiness, and urinary retention. For patients with more severe symptoms, accumulating data suggest that treatment with botulinum toxin injections into the salivary glands is effective¹⁴⁾⁻¹⁷⁾. It is necessary to inject botulinum toxin regularly, and it is necessary that a patient receive each treatment in a clinical setting. Therefore, repeated botulinum injections are impractical in the home.

Sialorrhea patients commonly undergo oral

rehabilitation, which can be done on an individual basis. The effects of rehabilitation are depends on the quality of an individual's daily training. On the other hand, rehabilitation with NMES has merit, because the stimulation load is constant and it can be used in a homecare setting. Use of NMES is contraindicated only for patients with indwelling pacemakers. There are individual differences in response to NMES, and it may take a patient some time to become accustomed to the stimulation of the machine. Studies are needed to evaluate treatment outcomes over a larger number of patients.

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Consent

The patient signed the informed consent agreement.

Competing Interests

The authors declare that they have no competing interests.

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