



Candy eating behaviour to improve swallowing function in dementia subjects



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ABSTRACT

Objectives: To develop and assess a dysphagia training method involving lollipop sucking training in older adults with dementia, clarify its effectiveness for improving oral function.

Methods: Twenty-five older adults with dementia (5 males and 20 females, mean age 90.8 ± 6.7 years) were participated in this study. Participants were trained in lollipop sucking once a day, 3 times a week for 6 months. Mini-Mental State Examination (MMSE), Barthel Index (BI), Candy Sucking Test (CST), and BMI values were measured before and after the training. Participants were grouped into those who achieved > 0.1 g/min increase in CTS value after the training (increase group) and those who did not (nonincrease group).

Results: No significant change was observed after the training. The increase group contained 4 patients and the non-increase group contained 21 patients. There were no significant differences in MMSE, BI, or BMI between the two groups before and after the training. However, the CST values of the increase group before the training (0.31 ± 0.13 g/min) were significantly lower than non-increase group (0.69 ± 0.27 g/min) ($p < 0.01$). Respective changes in BMI before and after training were 1.13 ± 0.85 kg/m² and -0.53 ± 1.76 kg/m² in the increase and non-increase, and the difference in these changes was statistically significant ($p = 0.04$).

Conclusions: Our new rehabilitation method was well accepted by older adults with dementia, and there was an improvement in oral function as a result of the rehabilitation, which had some good influence on weight gain.

1. Introduction

The increase in the number of older adults with dementia due to rapid population aging has become a serious social problem (Suh & Shah, 2001). In general, as dementia progresses and becomes severe, such patients experience feeding and swallowing problems, and this can cause aspiration pneumonia which has a strong influence on their life prognosis (Burns, Jacoby, Luthert, & Levy, 1990). One study reported that 85.8% of older adults with severe dementia who were residents of nursing homes were deemed to have dysphagia, and the 6-month mortality rate among them was 38.6% (Mitchell et al., 2009).

Compensatory measures such as the establishment of an eating environment (Rasley et al., 1993) and modifying liquid and food consistency (Curran & Groher, 1990; Logemann et al., 2008) are usually employed for dysphagia management (Stathopoulos & Felson Duchan, 2006). In recent years, exercise-based dysphagia therapy has received increased attention and its effectiveness has been reported (Robbins

et al., 2005, 2007). The use of such exercise to prevent dysphagia has also been investigated (Carroll et al., 2008). Many of dysphagia therapies require that the patient can understand instructions, thus they are difficult to administer in many patients whose cognitive function has declined. Therefore, there is an urgent need to develop a dysphagia training method that is applicable in older adults with dementia.

We have developed a sucking function test based on the amount of candy sucking measured as candy weight difference per minute, which we have called the Candy Sucking Test (CST), in order to quantify oral function in older adults with dementia (Mori et al., 2017). This test is simple and easily applicable even in older adults with dementia, and there was a significant relationship between CST values and oral transit time when swallowing yoghurt. The movements associated with sucking a lollipop constitute multiple exercises of oropharyngeal area involving tongue and cheek, lip closure, opening and shutting the mouth, and elevation of the pharynx and hyoid bone, among others. Such movements are considered to be applicable for dysphagia training

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in older adults with dementia who have difficult understanding instructions. The aims of the current study were to develop a lollipop sucking-based dysphagia training method for use in older adults with dementia, and clarify its effectiveness.

2. Methods

2.1. Participants

The participants in this study were recruited at one nursing home in Hiroshima prefecture, Japan. Inclusion criteria were a Mini-Mental State Examination (MMSE) score of less than 20 points, and an ability to maintain oral intake without obvious signs of pharyngeal phase dysphagia such as frequent coughing during eating. Also anyone who had experienced other dysphagia signs like food sticking in the throat and choking episodes was excluded in this study. Moreover, they were excluded if they had eating behavior disorders, including refusal to eat associated with decline in cognitive function, or if they suffered from severe chronic diseases such as diabetes, or liver and kidney dysfunction. As a result of these inclusion and exclusion criteria, 25 were selected among the 50 residents in this home (5 males and 20 females, mean age 90.8 ± 6.7 years). All subjects had diagnosed as senile dementia without any classification of causative disease. The study protocol was approved by the institutional review board of Vihara Hananosato Hospital, Hiroshima, Japan (approved on June 3rd, 2016), and written consent was obtained from the participants and their families following sufficient explanation of the study's objectives and its contents.

2.2. Lollipop sucking training

The main ingredients of the strawberry flavored lollipop used as the training food were starch syrup derived from reduced malt sugar, and low-saccharified reduced syrup designed to prevent increased blood glucose levels, and it was molded to a weight of 13.6 ± 0.6 g and a diameter of 20 mm. Participants were instructed to suck the lollipop for 10 min during each training session, and the examiner encouraged the participants to continue sucking without biting the lollipop or taking out of their mouth. The training was conducted once a day before lunch, 3 times a week for 6 months.

2.3. Outcomes

The MMSE was used to evaluate participants' cognitive functions (Folstein, Folstein, & McHugh, 1975), and the Barthel Index (BI) was used to evaluate physical function (Granger, Albrecht, & Hamilton, 1979). The CST was administered to evaluate oral function, and involved measuring the change in the weight of a lollipop per minute of sucking while the participant sucked the candy for 2 min (Fig. 1) (Mori et al., 2017). For nutritional status evaluation, body mass index (BMI) was calculated based on the height and weight of the participant.



Fig. 1. Sucking function test (Candy Sucking Test: CST).

The participant was instructed to suck a candy as much as possible for 2 min. The difference in the weight of the candy after 2 min of sucking was measured with an electronic scale.

Table 1
Outcome variable data before and after the training.

	Before training	After training	P value
MMSE	5.3 ± 6.9	4.3 ± 5.2	0.67
Barthel index	12.0 ± 17.0	7.8 ± 13.2	0.38
BMI	19.5 ± 3.5	19.2 ± 3.3	0.86
CSTvalue	0.63 ± 0.28	0.56 ± 0.22	0.46

2.4. Statistical analysis

MMSE, BI, CST, and BMI were measured before and after the training. The Wilcoxon rank sum test was used to compare the measurements. Participants were classified into a group of who exhibited an increase in CST value of > 0.1 g/min after the training (increase group) and a group that did not (non-increase group), and each measurement item was compared with the Wilcoxon rank sum test, and the Mann-Whitney *U* test was used for comparisons between groups. All analyses were performed using the statistical analysis software IBM SPSS 21.0 (IBM, Tokyo), and the statistical significance level was set at 5%.

3. Results

All subjects completed the study protocol. Table 1 shows the results for each variable before and after the training. No significant changes were observed after the training. The increase group contained 4 patients, and the non-increase group contained 21. There were no significant differences in MMSE, BI, or BMI between the two groups before and after the training. The CST values of the increase group before the training (0.31 ± 0.13 g/min) were significantly lower than those of the non-increase group (0.69 ± 0.27 g/min) ($p < 0.01$). However, there was no significant difference in the values after the training (0.52 ± 0.16 g/min vs. 0.57 ± 0.24 g/min, respectively). The respective changes in mean BMI before and after training were 1.13 ± 0.85 kg/m² and -0.53 ± 1.76 kg/m² in the increase and non-increase groups and the difference between the groups was statistically significant ($p = 0.04$).

4. Discussion

The results of this study indicate the possibility of using the lollipop sucking training method as a form of dysphagia rehabilitation in older adults with dementia.

In the ICD-10 (World Health Organization, 1993), dementia is defined as “a syndrome due to disease of the brain, usually of a chronic or progressive nature, in which there is disturbance of multiple higher cortical functions, including memory thinking, orientation, comprehension, calculation, learning capacity, language, and judgement.” Thus, it would become difficult for patients with the syndrome to follow instructions as dementia progresses, and in turn it would become hard to conduct various forms of training. It is an important finding that

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