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Original Article

Effects of the Otago exercise program on fall efficacy, activities of daily living and quality of life in elderly stroke patients

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Abstract. [Purpose] The purpose of this study was to determine the effects of the Otago exercise program on fall efficacy, activities of daily living, and quality of life in elderly stroke patients. [Subjects and Methods] Eight subjects performed the Otago exercise program three times per week, for 8 weeks. The outcome measures were the Fall Efficacy Scale score for fall efficacy, modified Barthel index for activities of daily living, and EQ-5D for quality of life. [Results] In our comparison of the results before and after the intervention, we found that the Otago exercise program improved fall efficacy significantly as well as the score for activities of daily living and quality of life, though not significantly. [Conclusion] We consider that the Otago exercise program is an effective method for improving fall efficacy in elderly stroke patients.

Key words: Elderly, Fall efficacy, Stroke

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INTRODUCTION

Stroke patients have a two-fold higher risk of falling than other patients of the same age or gender[1)]. In particular, 30% to 50% of the elderly those over 65 years old, experience falls every year[2)]. Falls may result in fractures, brain damage, or other secondary complications and may thus lead to decreased physiological functions and weakened muscle strength[3)]. Falls are affected by various factors, including personal, social, and environmental factors[4)]. Several studies on fall prevention exercise for the elderly have been performed[5–7)]. However, these studies were conducted by using different or unstandardized methods, and focused on physical functioning even though fall efficacy is one of the most significant factors of falls[8)]. Self-efficacy is the self-belief and capability to create a purposeful plan and implement it[9)]. Fear of falling is a significant complication of falls[8)].

The Otago exercise program (OEP) was developed at the Otago Medical School[10)]. The OEP is an evidence-based fall prevention program developed and designed for performance in the home by physical therapists[11)]. The OEP is composed of three domains, namely muscle strengthening, balance training, and walking, which suggests a program method in detail[10)]. In a previous study, elderly people who performed the OEP showed an increase in balance, muscle strength, and a decrease in both fall percentage and fall frequency[12)]. However, the research was conducted with healthy elderly people and did not estimate activities of daily living (ADLs) and quality of life (QoL). For the elderly, falls may restrict daily activities because of long-term pain[13)], and strong ADLs dependency was associated with high fall efficacy[14)]. QoL is highly associated with fall risk and general balance[15–17)]. Therefore the purpose of this study was to investigate the effects of the OEP on fall efficacy, ADLs, and QoL, and to suggest guidelines for implementing the OEP in elderly stroke patients.

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SUBJECTS AND METHODS

The study was conducted from April 2015 to June 2015, and the participants were recruited at the J City Health Center. All of the subjects were required to meet the following inclusion criteria: (a) diagnosis of stroke by a medical doctor, (b) age 65 years and older, (c) ability to walk with or without a caregiver, and (d) no cognitive dysfunction that would hinder understanding of the instructions. We excluded patients if they (a) had other neurological diseases, (b) were not able to read and understand the informed consent form, or (c) had participated in an exercise program for fall prevention. This study was approved by the institutional review board of Inje University. All the subjects were informed of the purpose and procedure of this study and agreed to participate in this study.

The fall prevention program was based on the OEP protocol. The OEP was performed for 50 minutes, three times per week for 8 weeks (2 group and 22 home programs) by two trained occupational therapists and four exercise assistants. All of the participants received the OEP protocol pamphlet and answered the telephone monitoring questions for checking the frequency of falls and OEP performance at the end of each week. The OEP starts with head movements, neck movements, back extension, trunk movements, and ankle movements. The muscle strengthening exercises include front knee strengthening, back knee strengthening, side hip strengthening, calf raises, and toe raises. Balance training includes knee bends, backwards walk, walk and turn, sideways walk, heel toe stand, heel toe walk, one leg stand, heel walk, toe walk, heel toe walk backwards, sit to stand, and stair walk. The Fall Efficacy Scale (FES) was used to assess fall efficacy. ADLs were measured by using the Modified Barthel Index (MBI)[18], which assesses the independent performance of basic ADLs. The EQ-5D was used to assess QoL. The EQ-5D was a multiple choice questionnaire that measures individual health status according to five domains, namely mobility, self-care, usual activities, pain, and anxiety/depression[19].

The statistical analysis in this study was conducted by using SPSS 22.0. The general characteristics of the subjects were analyzed by using descriptive statistics. The mean differences between the pre-intervention and post-intervention values were analyzed by using the Wilcoxon signed rank test. The significance level was set at $p < 0.05$ for all the measurements in this study.

RESULTS

In the population, the proportion of females was higher than that of males. The infarction rate was high for each lesion type. The proportion of paretic side was the same both right and left hemisphere, and the disease duration was 7.6 ± 4.0 years. The general characteristics of the subjects are shown in Table 1. After the OEP, the FES score significantly improved from 36.1 ± 11.7 to 50.6 ± 9.0 ($p < 0.05$). The MBI showed an improvement from 60.3 ± 21.5 to 68.0 ± 23.4, and the EQ-5D score also increased from 0.3 ± 0.3 to 0.4 ± 0.2. However, both the MBI and EQ-5D score did not show a statistically significant improvement ($p < 0.05$). The results are shown in detail in Table 2.

Table 1. General characteristics of subjects

Characteristics		N (%)
Gender	Male	3 (37.5)
	Female	5 (62.5)
Age (years)	65–74	5 (62.5)
	75–84	2 (25.0)
	85 and above	1 (12.5)
Lesion type	Hemorrhagic	3 (37.5)
	Infarction	5 (62.5)
Paretic side	Right	4 (50.0)
	Left	4 (50.0)
Disease duration (years)		7.6 ± 4.0*

*Mean ± SD

Table 2. Comparison of pre and post-intervention scores of FES, MBI and EQ-5D

	Pre-intervention	Post-intervention
FES	36.1 ± 11.7	50.6 ± 9.0*
MBI	60.3 ± 21.5	68.0 ± 23.4
EQ-5D	0.3 ± 0.3	0.4 ± 0.2

FES: Fall Efficacy Scale, MBI: Modified Barthel Index, Mean ± SD, *p <0.05

DISCUSSION

This study aimed to identify the effect of OEP on fall efficacy, ADLs and QoL in elderly stroke patients. Participants were recruited subjects who had visited J City Health Center. At the beginning of this study, 12 subjects participated in the OEP, of whom 8 completed the study. Four elderly participants did not finish the OEP because of personal reason: relocation outside the city for a short term, decondition state, or poor motivation.

The FES was used to assess fall efficacy, the MBI was used to estimate ADLs, and EQ-5D was used to assess QoL. Standardized instruments that are often used in stoke patients were used in all of the measurements in this study[20–22]. Our results showed that the OEP significantly improved fall efficacy. Similar findings were reported in a previous study for the effects of OEP on fall efficacy[9] and falls risk[23, 24]. However, the OEP did not significantly improve ADLs and QoL. Our results cannot be compared with those of previous studies because this study was the first to study the influence of the OEP on ADLs and QoL with OEP. Therefore, our results maybe attributable to the fact that chronic stroke patients seldom show improvement and that the intervention program was shorter than previous study.

The limitation of this study is that its results could not be generalized to elderly stroke patients because of the small number of participants. In this study, we did not conduct follow-up testing. We recommend that further studies be conducted with a larger sample size and follow-up tests.

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