An Analysis of Clinical Features in Individuals with Alzheimer’s Dementia Living in the Community using the Allen Cognitive Levels

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Abstract

Background/Objectives: There is a need to evaluate the functional cognitive levels necessary for helping and maintaining the roles of dementia patients in the community. Methods/Statistical Analysis: This study examined the ability to perform daily activities, depression, and the quality of life of dementia patients residing in the community according to their functional cognitive levels. 74 subjects participated in this study. Findings: The subjects’ cognitive functions, self-esteem, depression, ability to perform daily activities, and quality of life according to their functional cognitive levels (ACL) exhibited statistically significant differences in the basic cognitive functions, personal and instrumental activities of daily living, and depression between ACL 3 and 4. Also, the results showed that the correlations between ACL, the MMSE-KC, CERAD-BI, DCAP-IADL, GDS, and EQ-VAS had statistically significant correlations in all studied factors. Applications/ Improvement: Future studies should address the application of programs based on the functional cognition of dementia patients in the community, thereby improving the quality of life in dementia patients and their guardians.

Keywords: Alzheimer’s Disease, ACL, Community, Cognitive Levels, Functional Cognition

1. Introduction

In Korea, the incidence of dementia in elderly people aged 65 years or above was 9.18% (541,000 people) as of 2012 and is expected to increase approximately two-fold every 20 years with 1.27 million people¹. In this regard, the Ministry of Health and Welfare is promoting “The Establishment of a National Dementia Control System” as a national project by establishing “The Third Comprehensive Plan for National Dementia Control (2016–2020)” in 2015 to respond to the trend of rapid increases in the numbers of dementia patients².

Alzheimer’s disease, the most common cause-specific form of dementia, accounts for 60–70% of the total causes of dementia, and compared to the other forms of dementia, showed an increase of 19.9% in the annual average
number of patients treated and an increase of 27% in medical costs up to \(^2\). Dementia causes continuous and overall declines in the cognitive functions of individuals who formerly lived an ordinary life, resulting in the interruption of daily life\(^3\).

Dementia patients’ reduced ability to perform daily activities may affect their ability or opportunity to participate in their communities\(^4\), increase the burden of support on their guardians, reduce the quality of life of the patients and guardians, and increase the rate of institutionalization\(^5\). Therefore, the non-drug treatment of dementia patients residing in the community should focus on enhancing their functional cognitive levels and functions necessary to perform daily activities so as to provide them with the opportunity for community participation. It is important to have dementia patients continue activities appropriate for their functional cognitive levels and necessary to perform their role to prevent the progression of dementia into the advanced stages and maintain their functions\(^6\). In addition, it is also necessary to assess the functional levels of dementia patients to provide them with appropriate activities.

Dementia patients have difficulties in accurately evaluating the levels of their daily activities, including functional cognitive levels, due to declines in cognitive and language skills and social interaction skills.\(^7\) Also, reported that when dementia patients with cognitive disorders report their main symptoms themselves, there could be controversy regarding reliability and validity. For this reason, few studies have comprehensively researched functional cognitive levels, the ability to perform daily activities, and the degree of depression, and their relationships\(^8\). Moreover, few studies have evaluated the functional cognitive levels necessary for planning and applying intervention programs to help maintain the roles and functions of dementia patients in the community.

The Cognitive Disabilities Model developed by\(^9\) enables evaluation of functional cognitive levels by observing the task performance of dementia patients, and facilitates provision of activities that suit their abilities, interests, and environments. Such non-drug treatment based on the Cognitive Disabilities Model enables dementia patients to participate in the social activities of their communities by helping them maintain functional activities suitable for their cognitive levels\(^10\).

Therefore, this study aimed to examine the ability to perform daily activities, depression, and the quality of life of dementia patients residing in the community according to their functional cognitive levels. In relation to this, this study intends to provide useful basic data for the future development of non-drug treatment programs for dementia patients based on the Third Dementia Control Comprehensive Plan to establish a safe and convenient support system for dementia patients and their families with a focus on the community.

2. Methods

2.1 Subjects

The subjects of this study were dementia patients who visited the dementia prevention control center in City Y, Gyeonggi-do between June 2009 and March 2012. A psychiatrist determined whether the subjects had dementia according to the standards of the Diagnostic and Statistical Manual of Mental Disorders, 4th edition (DSM-IV)\(^3\) through a semi-structured interview using the Korean Version of Consortium to Establish a Registry of Alzheimer’s Disease (CERAD-K)\(^11\). The causes of dementia were examined by means of a neuropsychological test, blood test, and brain imaging according to the standards of the National Institute of Neurological and Communicative Disorders and Stroke and the Alzheimer’s disease and Related Disorders Association (NINCDS-ADRDA)\(^12\). The severity of dementia after the diagnosis was evaluated using the Clinical Dementia Rating (CDR)\(^13\).

2.2 Research Tools

2.2.1 Cognitive Functions

2.2.1.1 Allen Cognitive Levels Screening Test (ACLS)

The ACLS was developed to evaluate cognitive functions through the task of stitching. The Large ACLS may be used for patients with low vision or elderly patients, and the running stitch, whipstitch, and single cordovan stitch tests involve ascending difficulty. Scores range from 3.0 to 5.8, and a higher score indicates a higher level of cognition\(^14\).

2.2.1.2 Mini-Mental State Examination in the Korean version of the CERAD assessment packet (MMSE-KC)

The MMSE included in the Korean version of CERAD neuropsychological test battery uses the MMSE developed by\(^15\), while it was standardized and some of its
testing methods slightly revised. The maximum score is 30 points. A higher score indicates a higher level of cognitive functions and the final score is determined according to gender, the level of education, and age. The Kappa coefficient that represents the conformity between diagnoses based on the MMSE-KC test.

2.2.2 Functions to Perform Daily Activities

2.2.2.1 Consortium to Establish a Registry for Alzheimer’s Disease Neuropsychological Battery - Barthel Index (CERAD – BI).

This evaluation tool was developed by and consists of 10 questions on personal hygiene, taking a bath, eating meals, going to the toilet, ascending stairs, wearing clothes, controlling defecation, controlling urination, walking or moving in a wheelchair, and moving around the chair/bed.

2.2.2.2 Dementia Care Assessment Packet- Instrumental Activities of Daily Living (DCAP-IADL)

This tool measures instrumental daily activities and consists of three parts: social activities, personal management, and housework. It comprises 10 questions due to addition of several questions related to the circumstances of Korea.

2.2.3 Depression (Geriatric Depression Scale: GDS)

The GDS developed by is a dichotomous scale answered with “Yes/No” and consists of 30 questions. A domestic study reported it to have high levels of internal consistency and test-retest reliability.

2.2.4 Self-esteem (Rosenberg Self Esteem: RSE)

This self-esteem testing tool developed consists of 10 questions and uses a four-point Likert scale. The scores range from 10 to 40, and a higher score indicates a higher level of self-esteem.

2.2.5 Quality of life (European Quality of Life – Visual Analog Scale: EQ-VAS)

The EQ-VAS is a comprehensive quality-of-life measuring tool developed by the EuroQOL group organized by European countries, which indicates individuals’ health conditions using gradations. The EQ-VAS uses a visual analogue scale (VAS) designed with a vertical graduated ruler on which the best and worst health conditions are indicated as 100 and 0, respectively. Each individual is instructed to indicate his/her subjective and overall health conditions on the date when the survey is conducted.

3. Data Analysis

The data collected from this study were analyzed using PASW Statistics 21.0 (Chicago, IL, USA). Means, standard deviations, frequencies, and percentages were presented using descriptive statistics to confirm the subjects’ general characteristics. Following this, an independent t-test was conducted to compare cognitive functions, the ability to perform basic daily activities, the ability to perform instrumental daily activities, depression, self-esteem, and the quality of life according to the ACLS, and a Pearson correlation analysis was performed to assess the correlation between the ACLS and each domain.

4. Results

4.1 General Characteristics of the Subjects

Seventy-four subjects participated in this study. In terms of age, elderly people aged 75 to 84 years formed the largest group (67.6%). Males and females accounted for 45.9% and 54.1%, respectively. Among the subjects, CDR1 was the most common, at 60.8% (Table 1).

Table 1. Characteristics of the subjects (N=74)

| Variable              | Frequency | Percentage (%) |
|-----------------------|-----------|----------------|
| **Age (years)**       |           |                |
| 65–74                 | 13        | 17.6           |
| 75–84                 | 50        | 67.6           |
| 85≥                   | 11        | 14.8           |
| **Sex**               |           |                |
| Male                  | 34        | 45.9           |
| Female                | 40        | 54.1           |
| **Education (year)**  |           |                |
| None                  | 10        | 13.5           |
| 6≤                    | 5         | 6.8            |
| 6–12                  | 48        | 64.8           |
| 13≥                   | 11        | 14.9           |
| **Clinical Dementia Rating** | | |
| 0.5                   | 17        | 23.0           |
| 1                     | 45        | 60.8           |
| 2                     | 12        | 16.2           |
4.2 General Characteristics of the Home Care Service Subjects According to Functional Cognitive Levels

The functional cognitive levels of the subjects measured via the ACLS indicated that 46 subjects (62.2%) fell within ACL 3 (3.0–3.8) and 28 subjects (37.8%) fell within ACL 4 (4.0–4.8).

The results of comparing the subjects’ cognitive functions, self-esteem, depression, ability to perform daily activities, and quality of life according to their functional cognitive levels exhibited statistically significant differences in the MMSE-KC, CERAD-BI, DCAP-IADL, and GDS between ACL 3 and 4. In addition, the subjects of ACL 3 exhibited a higher mean RSE score and a lower mean EQ-VAS score than those of ACL 4 (Table 2).

4.3 Correlations between Functional Cognitive Levels and each Evaluation Domain

An examination of the correlations between functional cognitive levels and each evaluation domain showed statistically significant correlations between the ACLS and the MMSE-KC, CERAD-BI, DCAP-IADL, GDS, and EQ-VAS (Table 3).

Table 2. Mean and standard deviation Allen cognitive levels in each domain and comparison of domains between Allen cognitive levels 3 and 4

| Domain       | ACL 3 (n=46) | ACL 4 (n=28) | P     |
|--------------|--------------|--------------|-------|
| MMSE-KC      | 12.74±3.947  | 18.82±4.892  | 0.000**|
| CERAD-BI     | 73.70±21.844 | 96.25±5.713  | 0.000**|
| DCAP-IADL    | 23.02±7.006  | 13.64±6.684  | 0.000**|
| GDS          | 16.41±8.207  | 11.82±7.097  | 0.017* |
| RSE          | 24.43±1.515  | 24.29±1.084  | 0.651  |
| EQ-VAS       | 50.37±19.258 | 58.93±14.231 | 0.045* |

*p<0.05 **p<0.001

MMSE-KC: Mini-Mental State Examination in Korean version
CERAD-BI: Consortium to establish a registry for Alzheimer’s disease neuropsychological battery - Barthel Index
DCAP-IADL: Dementia care assessment packet-instrumental activities of daily living
GDS: Geriatric Depression Scale
RSE: Rosenberg Self Esteem
EQ-VAS: European Quality of Life – Visual Analog Scale

Table 3. Correlations of Allen cognitive levels and each domain

| Variable     | ACL | MMSE-KC | CERAD-BI | DCAP-IADL | GDS | RSE | EQ-VAS |
|--------------|-----|---------|----------|-----------|-----|-----|--------|
| ACL          | 1.00|         |          |           |     |     |        |
| MMSE-KC      | 0.560** | 1.00     |          |           |     |     |        |
| CERAD-BI     | 0.465** | 0.602** | 1.00     |           |     |     |        |
| DCAP-IADL    | -0.517** | -0.487** | -0.686** | 1.00      |     |     |        |
| GDS          | -0.294*  | -0.169  | -0.358** | 0.530**   | 1.00|     |        |
| RSE          | -0.147   | -0.187  | -0.247*  | 0.235*    | 0.006 | 1.00 |        |
| EQ-VAS       | 0.310**  | 0.195   | 0.296*   | -0.318**  | -0.422** | -0.066 | 1.00   |

ACL: Allen cognitive level
MMSE: Mini-Mental State Examination
CERAD-BI: consortium to establish a registry for Alzheimer’s disease neuropsychological battery - Barthel Index
DCAP-IADL: Dementia care assessment packet-instrumental activities of daily living
GDS: Geriatric Depression Scale
EQ-VAS: European Quality of Life – Visual Analog Scale
RSE: Rosenberg Self Esteem
5. Discussion

As dementia progresses into the advanced stages, patients experience declines in their cognitive functions and find it difficult to manage their daily lives. Therefore, intervention programs for dementia patients in the community should be provided according to their functional cognitive levels. In this regard, this study divided subjects enrolled via home visits into ACL 3 and 4 according to their functional cognitive levels, and found statistically significant differences in the basic cognitive level and ability to perform daily activities between the two groups (Table 2).23 reported significant static correlations between functional cognitive levels and basic cognitive-level measuring tools. The results of this study were in agreement with the findings of Min, 23 as the subjects of ACL 4, a higher functional cognitive level, showed a higher mean score in the MMSE-KC than those of ACL 3.

In addition, Gold24 reported statistically significant correlations between activities of daily living (ADL) and cognitive disorders, which are important clinical symptoms of dementia. Other previous studies also demonstrated correlations between the ACLS and function within the community and the ability to perform daily activities.25,26 In the present study, the subjects with ACL 3 and 4 exhibited statistically significant differences in basic and instrument daily activities and showed a high correlation between daily activities and the ACL (0.465**), which was in line with the findings of previous studies.

As the above shows, close correlations between the ACL and the performance of daily activities have been verified, and unlike basic cognitive ability-measuring tools, such as the MMSE, the ACL measure functional cognitive capacities. “Functional cognition” refers to information-processing procedures observed in the context of performance patterns, and reflects general cognitive functions rather than local brain functions or intelligence. The ACL result from phasing such functional cognitive capacities. For this reason, the ACL are widely used by occupational therapists as they enable evaluation of the level of support and learning capabilities necessary for performing daily and new tasks.27-28 According to Allen’s model, the performance of the ACL can be generalized into that of daily tasks and provides information related to functional levels and adaptability within the community. Therefore, the ACL are also useful for educating the guardians of dementia patients by providing them with the skills required to support the patients throughout the progression of dementia.29

According to the functional cognitive levels of the ACL,30 individuals at ACL 4.6 or above can live in the community independently and participate in familiar community activities. Even those at ACL 4.4 can walk on familiar streets or use familiar bus routes. In addition, individuals at ACL 4.0 can perform sequential activities comprising a few stages. For example, they can prepare light refreshments or meals. However, those at ACL 3.8 or below can either use daily tools or perform activities properly only when dangerous environmental elements have been removed. Those at ACL 3.5 require the support of their guardians so that they would prepare items necessary for the patients’ activities in advance or help the patients perform activities safely. Those at ACL 3.4 require assistance according to the arrangement of objects and the sequence of activities to perform daily activities in a familiar environment.

However, the subjects of ACL 3 showed a higher level of depression and lower levels of basic cognition, daily activities, and quality of life than those of ACL 4. This is in agreement with the result of a cohort study performed by in Odense, Denmark, in which a major factor that determines the quality of life in dementia patients was independence in the performance of daily activities. This suggests that the provision of an intervention to help sustain the daily lives of dementia patients in the community by considering their cognitive levels is important to improve their quality of life, and can also reduce the burden on their guardians.31-32

However,33 reported that emotional problems such as anxiety and depression, rather than cognitive functions, have statistically significant correlations with low quality of life, and feelings or personality traits markedly affect the quality of life by forming one’s perspective on life. In34-35 also reported a different result from that of the present study by noting that psychological problems such as depression have greater levels of influence on the quality of life than do cognitive or functional conditions.

The present study has several limitations: First, it included only dementia patients residing in a specific region. Second, it targeted patients with Alzheimer’s disease among various causes of dementia. Therefore, the study’s results cannot be generalized to all dementia patients. Consequently, future studies should address the application of programs based on the functional cognition of dementia patients in the community, thereby improving the quality of life in dementia patients and their guardians.
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