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ORIGINAL ARTICLE

Observational Study

Role of comprehensive geriatric assessment in screening for mild cognitive disorders

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Abstract

BACKGROUND

The role of comprehensive geriatric assessment (CGA) in screening for mild cognitive disorders was not known.

AIM

To evaluate the role of CGA in screening for mild cognitive disorders.

METHODS

A total of 100 elderly people who underwent health examinations in our hospital and community between January 2020 and December 2021 were included for analysis. Using Petersen as the diagnostic gold standard, healthy individuals were included in the control group and patients with mild cognitive impairment were assigned to the study group. The correlation between the cognitive function of the patients and their baseline clinical profiles was analyzed. Patients' Montreal Cognitive Assessment (MoCA) and CGA screening results were compared, and the sensitivity and specificity were calculated to assess the screening role of CGA.

RESULTS

CGA assessment yielded higher diagnostic accuracy than MoCA. The results of the multivariate regression analysis showed no correlation of gender, age, body mass index and literacy with cognitive function. Patients with mild cognitive impairment obtained significantly lower MoCA scores than healthy individuals ($P < 0.05$). In the CGA scale, patients with mild cognitive impairment showed significantly lower Mini-mental State Examination, Miniature Nutritional Assessment and Berg Balance Scale scores, and higher Activity of Daily Living, Instrumental Activities of Daily Living Scale and Frailty Screening Inventory scores than healthy individuals ($P < 0.05$), whereas the other assessment scales showed no significant differences ($P > 0.05$). The CGA provides higher diagnostic sensitivity and specificity than the MoCA ($P < 0.05$).

CONCLUSION
CGA allows accurate identification of mild cognitive impairment with high sensitivity and specificity, facilitating timely and effective intervention, and is thus recommended for clinical use.

Key Words: Comprehensive geriatric assessment; Mild cognitive impairment; Screening; Montreal Cognitive Assessment; Sensitivity; Specificity

Core Tip: Comprehensive geriatric assessment allows accurate identification of mild cognitive impairment with high sensitivity and specificity, facilitating timely and effective intervention, and is thus recommended for clinical use.

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INTRODUCTION

Mild cognitive impairment (MCI) is the transitional state between normal aging and mild dementia and is an early stage of dementia[1,2]. People with MCI present with memory impairment that exceeds the allowable range for their age and culture. However, they experience normal social work or daily functioning and do not meet the diagnostic criteria for dementia. Evidence suggests that within the following 2-5 years, mild cognitive impairment is associated with a higher risk of developing dementia compared to age-appropriate non-mild cognitive impairment, which may be attributable to multiple diseases[3]. There is a prevalence of mild cognitive impairment of over 15% in people over 65 years of age, with 10%-15% of the population deteriorating to Alzheimer's disease within one year per year, whereas the prevalence in the normal population averages only 1%-2%. Therefore, enhanced detection, intervention, or delay of the onset of cognitive impairment in mild cognitive impairment at an early clinical stage is necessary[4,5]. Timely diagnosis of patients with mild cognitive impairment is a prerequisite for treatment and can efficiently mitigate the progression of the disease. Screening for mild cognitive impairment is normally performed using the Montreal cognitive assessment (MoCA)[6,7], a scale that references the cognitive elements and scores of the Mini-mental State Examination (MMSE) to assess mild cognitive impairment[8]. However, the results of studies related to the cut-off point, sensitivity and specificity of the scale vary considerably. Comprehensive geriatric assessment (CGA)[9] is a multidisciplinary approach that assesses the physical health, functional status, mental health and social-environmental status of older people[10]. CGA can facilitate timely treatment, slow down the disease process and reduce dementia through multidimensional analysis of MCI[11,12]. To this end, the current research was performed to evaluate the role of CGA in screening for mild cognitive disorders.

MATERIALS AND METHODS

Case selection

A total of 100 elderly people who underwent health examinations in our hospital and community between January 2020 and December 2021 were included for analysis. Written informed consent was obtained from all patients in this study.

Inclusion and exclusion criteria

Inclusion criteria: (1) Patients with objective signs of impairment in one or more areas of cognitive function; (2) patients met the relevant diagnostic criteria in the Diagnosis and Treatment of Mild Cognitive Impairment; and (3) clinical information was complete, with no restriction on gender, and age no less than 60 years.

Exclusion criteria: (1) Patients met the diagnostic criteria for clinical dementia; (2) physical organ disability, including vision and hearing; and (3) inability to cooperate with the completion of this study for psychiatric reasons.

Methods

Using Petersen as the diagnostic gold standard, healthy individuals were included in the control group and patients with mild cognitive impairment were assigned to the study group. The correlation between the cognitive function of the patients and their baseline clinical profiles was analyzed. Patients' MoCA and CGA screening results were compared, and the sensitivity and specificity were calculated to assess the screening role of CGA.

Outcome measures

Petersen diagnosis: The patient reported memory loss for no less than 3 mo, which was confirmed by others; age-incompatible objective memory decline, with overall normal cognitive function and a Geriatric Depression Scale (GDS) score of 2-3; patients had essentially normal activities of daily living and an Activity of Daily Living (ADL) score no higher than 18; patients did not meet the US NIA-AA dementia diagnostic criteria for dementia, with a CDR score = 0.5.

MoCA: The Chinese version of the MoCA scale developed by Peking Union Medical College Hospital and Professor Nasreddine was used for assessment. The scale has a total score of 30 and includes eight cognitive domains, namely time, positional orientation, language, calculation, memory and delayed memory, visuospatial ability, executive function, attention and abstract thinking. Scores are proportional to cognitive functioning, with scores below 26 indicating impaired cognitive functioning[13].

CGA: The CGA assesses the cognitive status of patients through the General Medical Assessment, Physical Functioning Assessment, Psychosocial Assessment, Social Health Assessment, Environmental Assessment, Quality of Life Assessment and Assessment of Common Symptoms or Problems in Older Adults. It includes the GDS, Geriatric Anxiety Inventory (GAI), MMSE, Miniature Nutritional Assessment (MNA), ADL, Instrumental Activities of Daily Living Scale (IADL), Frailty Screening Inventory (FRAIL), Berg Balance Scale (BBS), Falls Risk Factor Assessment (FRAF), and PAGAR. GDS, GAI, MMSE, MNA, BBS, FRAF, and PAGAR were proportional to the CGA score, and ADL, IADL, and FRAIL were inversely proportional to the CGA score.

Statistical analysis

SPSS 26.0 was used for data analyses. Measurement data were expressed as mean ± SD and tested using independent samples *t*-test. Count data were expressed as number of cases (%) and tested using χ^2 test. Pearson correlation analysis was applied for multiple regression analysis. Statistical significance was indicated by $P < 0.05$.

RESULTS

Screening results

Petersen diagnosed 62 healthy individuals as controls and 38 patients with mild cognitive impairment as the study group. The MoCA diagnosed 30 cases of healthy individuals and 38 cases of patients with mild cognitive impairment, while the CGA assessment showed 58 cases of healthy individuals and 36 cases of patients with mild cognitive impairment. CGA assessment yielded higher diagnostic accuracy than MoCA (Table 1 and Table 2).

Baseline patient profiles

The control group consisted of 41 males and 21 females, aged 62-80 (71.84 ± 7.21) years, with a body mass index (BMI) of 20-26 (24.18 ± 2.11) kg/m^2. There were 5 cases of illiteracy, 18 cases with an education level of primary school, 25 cases of junior high school, and 14 cases of high school and above. The study group consisted of 25 males and 13 females, aged 61-79 (71.52 ± 7.36) years, with a BMI of 20-26 (24.21 ± 2.07) kg/m^2. There were 2 cases of illiteracy, 11 cases with an education level of primary school, 16 cases of junior high school, and 9 cases of high school and above. The two arms were well-balanced in terms of baseline patient profiles ($P > 0.05$, Table 3).

Correlation

The results of the multivariate regression analysis showed no correlation of gender, age, body mass index and literacy with cognitive function ($P > 0.05$, Table 4).

MoCA scores

MoCA score in the control group was 26.88 ± 2.14 and the MoCA score in the study group was 20.86 ± 2.56. Patients with mild cognitive impairment obtained significantly lower MoCA scores than healthy individuals ($P < 0.05$, Table 5).

CGA scores

In the CGA scale, patients with mild cognitive impairment showed significantly lower MMSE, MNA and BBS scores, and higher ADL, IADL and FRAIL scores than healthy individuals ($P < 0.05$), whereas the other assessment scales showed no significant differences ($P > 0.05$) (Table 6).

Application value of CGA vs MoCA

The sensitivity and specificity of MoCA was 0.761 and 0.714, while the sensitivity and specificity of CGA was 0.882 and 0.964. The CGA provides higher diagnostic sensitivity and specificity than the MoCA ($P < 0.05$) (Table 7).

DISCUSSION

Cognitive impairment can affect learning, memory, social functioning, language, visuospatial function, and attention, and severe cognitive impairment can lead to dementia. Statistics show that 5%-10% of people with mild cognitive impairment

Table 1 Montreal cognitive assessment results

MoCA results	Study group	Control group
Normal	30	7
Mild cognitive impairment	8	55
Total	38	62

MoCA: Montreal cognitive assessment.

Table 2 Comprehensive geriatric assessment results

CGA results	Study group	Control group
Mild cognitive impairment	36	4
Normal	2	58
Total	38	62

CGA: Comprehensive geriatric assessment.

Table 3 Baseline patient profiles

	Control group, *n* = 62	Study group, *n* = 38	*t* value	*P* value
Sex				
Male	41	25	-	-
Female	21	13	-	-
Age (yr) (mean)	62-80 (71.84 ± 7.21)	61-79 (71.52 ± 7.36)	0.214	0.831
BMI (kg/m^2) (mean)	20-26 (24.18 ± 2.11)	20-26 (24.21 ± 2.07)	0.070	0.944
Education level				
Illiterate	5	2	-	-
Primary school	18	11	-	-
Junior high school	25	16	-	-
High school and above	14	9	-	-

BMI: Body mass index.

Table 4 Correlation of baseline profiles and cognitive function

	B	SE	B'	*t* value	*P* value
Sex	-1.612	2.705	-0.079	-0.521	0.511
Age	-0.154	0.088	-0.227	1.794	0.094
BMI	0.012	0.069	0.034	0.314	0.807
Education level	0.714	0.763	0.185	0.894	0.352

BMI: Body mass index.

develop dementia each year, which is higher than the 1%-2% annual prevalence in the general population. Nearly 50 million people worldwide suffered from dementia in 2016, and its prevalence has been increasing[14]. The aging population and the increasing prevalence of dementia are the primary contributors to the expected increase in the cost of dementia. Few clinically effective medications are available for the treatment of cognitive impairment. However, studies have shown that 30%-50% of patients initially diagnosed with mild cognitive impairment recover to a normal cognitive

Table 5 Montreal cognitive assessment scores

	Control group	Study group	*t* value	*P* value
n	62	38	-	-
MoCA scores	26.88 ± 2.14	20.86 ± 2.56	12.663	< 0.001

MoCA: Montreal cognitive assessment.

Table 6 Comprehensive geriatric assessment scores

	Control group, *n* = 62	Study group, *n* = 38	*t* value	*P* value
GDS	9.61 ± 3.98	10.05 ± 3.88	0.542	0.589
GAI	3.62 ± 3.25	3.44 ± 3.18	0.271	0.787
MMSE	28.85 ± 1.85	26.05 ± 1.27	8.212	< 0.001
MNA	22.51 ± 4.14	19.14 ± 3.52	4.176	< 0.001
ADL	17.25 ± 2.62	19.58 ± 2.14	4.616	< 0.001
IADL	10.52 ± 3.51	12.88 ± 3.54	3.253	0.002
FRAIL	1.25 ± 0.25	1.89 ± 0.57	7.728	< 0.001
BBS	44.52 ± 7.98	39.21 ± 8.11	3.210	0.002
FRAF	2.62 ± 1.25	2.68 ± 1.31	0.229	0.819
PAGAR	8.29 ± 2.58	8.33 ± 2.49	0.076	0.940

CGA: Comprehensive geriatric assessment; GDS: Geriatric depression scale; GAI: Geriatric anxiety inventory; MMSE: Mini-mental state examination; MNA: Miniature nutritional assessment; ADL: Activity of daily living scale; IADL: Instrumental activities of daily living scale; FRAIL: Frailty screening inventory; BBS: Berg balance scale; FRAF: Falls risk factor assessment.

Table 7 Sensitivity and specificity of Montreal cognitive assessment and comprehensive geriatric assessment

	MoCA	CGA
Sensitivity	0.761	0.882
Specificity	0.714	0.964

MoCA: Montreal cognitive assessment; CGA: Comprehensive geriatric assessment.

level during postoperative care. Therefore, timely screening and prevention will contribute to improving the standard of living of patients and reducing the family, social and economic burden[15,16]. Patients with mild cognitive impairment show no typical clinical manifestations in the early stages, which poses difficulties in the clinical diagnosis of the disease and is detrimental to the early identification and targeted treatment of the condition.

The MoCA is an assessment scale for mild cognitive impairment developed by Canadian scientists based on clinical experience and with reference to the cognitive elements and scores of the MMSE[17,18]. In the present study, patients with mild cognitive impairment showed significantly lower MMSE, MNA, and BBS scores, and higher ADL, IADL and FRAIL scores than healthy individuals, whereas the other assessment scales showed no significant differences, and the CGA provides higher diagnostic sensitivity and specificity than the MoCA, which was consistent with the findings of previous studies. It has been reported that the relative risk of conversion to dementia in those with cognitive abnormalities is 6.4 times higher than in those with normal cognition. Mild cognitive impairment is an early manifestation of dementia, and the MMSE is a scale that has been used to assess cognitive ability. It has been proposed that the dietary patterns of patients have implications for future perceptions in life, and that most older people require treatment for nutritional deficiencies to prevent cognitive decline. As a result, greater emphasis should be placed on screening for nutritional status in patients with mild cognitive impairment to ensure adequate nutritional support. In 2013, the International Academy of Nutrition and Aging and the International Association of Geriatrics introduced the concept of 'cognitive deprivation', linking cognition to deprivation. The present study also found that the results of the multiple regression analysis showed that gender, age, BMI and literacy were not correlated with cognitive function. However, this is inconsistent in previous studies and may be the result of the large variation in sample size from one study to another, with increased sample size contributing to the analysis of cognitive function factors.

The MoCA scale focuses on a single disease and fails to fully address the healthcare needs of older people. CGA was originally proposed by British scientists in 1946 as an intervention to comprehensively assess the illness, physical ability, cognitive, psychological, social and economic status of elderly patients at multiple levels, so as to comprehensively assess older people with a function-oriented approach during the recovery phase of chronic disease to guide treatment and health maintenance. Currently, it is widely used to determine the level of health functioning of older people and is recognized for its effectiveness in improving diagnosis, prognosis and quality of life of patients. Nevertheless, no consensus has been reached on the content of their specific assessments. Heterogeneity in the size of different research institutions precludes the comparison of different findings, for which the identification of standardized comprehensive CGA assessments for older people is an effective approach. However, a large body of evidence is required[19,20].

Limitations

Research suggests that all people over the age of 70 years ought to undergo annual subjective or objective cognitive testing with their healthcare provider. However, this has significantly increased the workload of medical staff, resulting in high human costs. This could be improved in the future through the development of a fee schedule for comprehensive assessments, including health insurance, changes to the writing of health records, the addition of a "comprehensive assessment and diagnosis for older people" and the conversion of different assessment scales into electronic health records. Limitations of the current study include the risk of bias due to insufficient sample size and lack of sample diversity. Future studies will expand the sample to further improve the protocol and provide more references for future relevant diagnostic treatments.

CONCLUSION

CGA allows accurate identification of mild cognitive impairment with high sensitivity and specificity, facilitating timely and effective intervention, and is thus recommended for clinical use.

ARTICLE HIGHLIGHTS

Research background

Comprehensive geriatric assessment (CGA) is a multidisciplinary approach that assesses the physical health, functional status, mental health and social-environmental status of older people. CGA can facilitate timely treatment, slow down the disease process and reduce dementia through multidimensional analysis of Mild cognitive impairment.

Research motivation

This study found that CGA allows accurate identification of mild cognitive impairment with high sensitivity and specificity, facilitating timely and effective intervention.

Research objectives

This study was conducted to evaluate the role of comprehensive geriatric assessment in screening for mild cognitive disorders.

Research methods

Using Petersen as the diagnostic gold standard, healthy individuals were included in the control group and patients with mild cognitive impairment were assigned to the study group. The correlation between the cognitive function of the patients and their baseline clinical profiles was analysed. Patients' Montreal Cognitive Assessment (MoCA) and CGA screening results were compared, and the sensitivity and specificity were calculated to assess the screening role of CGA.

Research results

CGA assessment yielded higher diagnostic accuracy than MoCA. The results of the multivariate regression analysis showed no correlation of gender, age, body mass index and literacy with cognitive function. Patients with mild cognitive impairment obtained significantly lower MoCA scores than healthy individuals. In the CGA scale, patients with mild cognitive impairment showed significantly lower Mini-mental State Examination, Miniature Nutritional Assessment and Berg Balance Scale scores, and higher Activity of Daily Living, Instrumental Activities of Daily Living Scale and FRAIL scores than healthy individuals. The CGA provides higher diagnostic sensitivity and specificity than the MoCA.

Research conclusions

CGA allows accurate identification of mild cognitive impairment with high sensitivity and specificity, facilitating timely and effective intervention, and is thus recommended for clinical use.

Research perspectives

Future studies will expand the sample to further improve the protocol and provide more references for future relevant diagnostic treatments.

FOOTNOTES

Author contributions: Yu J and Lu SR contributed equally to this work; Wang Z, Yang Y designed the research study; Zhang BS performed the research; Hong K contributed new reagents and analytic tools; Xu Q analyzed the data and wrote the manuscript; and all authors have read and approve the final manuscript.

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