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Evaluation of cognitive impairement in dementia/depression geriatric patients

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***Abstract*---**Three-hundred-and-thirty-four cognitive profiles from neuropsychological examinations assessed during a 2-year period from geriatric patients of a day clinic in the U.P were analyzed. For this purpose, the profiles were divided into the following subgroups: (1) Mild Cognitive Impairment, no depression (2) Onset or mild dementia, no depression (3) No cognitive deficit, depression (4) cognitively impaired (MCI, dementia) and depression. Subgroups were be compared using analysis of variance (independent variable IV: diagnostic groups, dependent variable DV: cognitive functions) to reveal specific differences that will allow a differential diagnosis. Post-hoc comparisons and a graphical representation of the cognitive profiles were also investigated. All cognitive profiles with a Mini-Mental-State-Examination (MMSE) score of 25 or more points were selected for analysis if they had complete data from the following testing procedures: MMSE, clock drawing test, Geriatric Depression Scale (GDS), Syndrom-Kurztest (SKT), Nuremberg Aging Inventory (NAI) maze test, Wechsler Adult Intelligence Scale (WAIS) similarities, Rivermead Be- havioral Memory Test (RBMT) story immediate and delayed. The results will help to improve the differential diagnostic examination of older depressed people with and without cognitive impairment: Depressed patients usually have no objectifiable memory impairment and inconspicuous scores in the logical structure of thought processes, while attention was usually impaired in both depressed and demented patients.

***Keywords*---**neuropsychology, differential diagnosis, depression, MCI, dementia.

Introduction

Cognitive deficits (in mild cognitive impairment/MCI and dementia) and depression are highly relevant issues in older age: Meta-analysis [1] estimates

of MCI incidence per 1000 person-years between 22.5 (for ages 75–79 years), and 60.1 (for ages 85+ years), the prevalence for all-cause dementia among individuals aged 50 and older is 697 per 10,000 persons [2]. Depression in old age is also a relevant health problem, with prevalence estimates for major depression in Europe ranging from 9% to 23% [3]. The differential diagnosis of these three disorders is, therefore, a highly relevant topic in the treatment of older persons, yet there are hardly any studies comparing neuropsychological profiles.

The Geriatric Day Clinic is a day-care facility with 45 places where multimorbid older patients are treated. The most frequent main or referral diagnoses relate to internal medicine and orthopedics, such as cardiovascular diseases, gait disorders, dizziness, the tendency of falling, musculoskeletal disorders, and chronic pain. During the standard treatment period of three weeks, each patient receives both individual and group therapies by various therapeutic professions.

About one third of the patients have a secondary diagnosis of depression, about half of them show cognitive deficits in the context of MCI (10%) or dementia (40%). In total, far more than half of the patients have a secondary diagnosis in the area of psychological disorders (including dementia, depression, anxiety, somatoform disorder), which is why (neuro-) psychological diagnostics and therapy are of particular importance at the day clinic. Patients with a respective diagnosis are treated both individually and in groups by psychologists working in the day clinic, all of whom have a neuro-/geronto-psychological focus of training and activity.

A very frequent issue is, therefore, the differential diagnosis of MCI/dementia/depression by means of a detailed neuropsychological examination and psychological assessment inter- view. The diagnosis is made in accordance with the ICD-10, which is usually in the medical context, and the current guidelines are always taken into account. According to the S3 guideline Dementia [4], due to the lack of an exact and universally valid definition, MCI is defined as a syndrome consisting of subjective and objectifiable cognitive impairment with preserved activities of daily living. In particular, amnestic MCI with memory impairment as a major symptom is associated with an increased risk of developing dementia.

Methods

Each patient of the clinic was screened at admission with the Mini-Mental-State- Examination (MMSE), clock drawing test and Geriatric Depression Scale (GDS), some of them were presented for a detailed neuropsychological examination according to medical indication because 1. the presence of cognitive deficits was suspected during medical ad- mission or cognitive screening (MMSE and clock drawing test), or 2. the patient complained of subjective cognitive impairments, or 3. cognitive deficits were observed by the staff during their stay. For the purpose of this paper, all these test profiles from the past five years that met the inclusion criteria (verified diagnosis of MCI, onset or mild dementia, and/or a depressive episode) were systematically analyzed. Since in the differential diagnosis of MCI, depression and dementia,

the mild manifestations of dementia are of interest, not advanced dementias, all profiles with an MMSE score below 25 points were excluded to exclude patients with more severely impaired cognition and advanced dementia as much as possible.

The diagnosis of cognitive impairment was made after a detailed neuropsychological examination (NPU) and after cerebral imaging (CT or MRI). Newer methods, such as functional Near-Infrared Spectroscopy [5,6] have not yet been implemented as a standard at the clinic. Furthermore, detailed blood analysis was performed as part of the exclusion diagnosis, and the ICD dementia criterion of impairments relevant to daily living was operationalized on the basis of a behavioral observation during the stay in the day clinic. In addition to the screenings MMSE, clock drawing test and GDS performed in the admission assessment, the following test procedures were applied during the neuropsychological examination: SKT, NAI maze test, WAIS similarities, RBMT story immediate and delayed.

The diagnosis of depressive disorder was made on the basis of a clinical interview covering all ICD-10 depression diagnostic criteria. Based on the verified diagnoses, patients were divided into four groups:
MCI, no depression
dementia, no depression
depression, no cognitive deficit
cognitively impaired (MCI or dementia) and depression.
Analyses of variance (Independent Variable IV: diagnosis group, Dependent Variable DV: cognitive functioning) were calculated and posthoc comparisons were performed to show differences in neuropsychological profiles.

Results

A total of 334 test profiles were included in the sample, with small differences in the number of patients for the individual test procedures, since not all procedures could be performed as intended for every patient (for example, due to motor limitation, visual or hearing impairment). The average age of the patients was 81 years (SD 5.2, min 61, max 93 years), 68% of the patients were female. The patients were distributed among the individual diagnostic groups.

Of the 101 patients with depression, 63 patients (62%) were also cognitively impaired (14 patients had a diagnosis of MCI and 49 suffered from dementia); due to the unequal group sizes these were combined into the cognitively impaired (MCI or dementia) and depression group for the calculations.

These four groups were then subjected to a more detailed analysis to identify differences and distinctive features in the neuropsychological test profile. For this purpose, a multivariate analysis of variance (MANOVA) was performed for both the screenings and the detailed neuropsychological examination with the defined diagnostic groups as independent variables (IV) and the test procedures as dependent variables (DV). In addition, posthoc tests (Bonferroni or Games–Howell) were performed.

Multivariate analysis of variance revealed a highly significant difference between diagnostic groups for screening procedures as dependent variables, $F(9791) = 16.932$, $p < 0.001$, partial eta-square 0.133, Wilk's lambda = 0.651. The MMSE showed a statistically significant differences between the "dementia" group and the "MCI" group, $p = 0.022$ (Mdiff = 0.83, 95%-CI [1.58, 0.08]) and between "dementia" and "depression", $p = 0.001$ (Mdiff = 1.37, 95%-CI [2.33, 0.40]), but not between "dementia" and "cognitively impaired AND depression", $p = 1.0$ (Mdiff = 0.38, 95%-CI [1.17, 0.40]). There was also no significant difference between "MCI" and "depres- sion", $p = 1.0$ (Mdiff = 0.54, 95%-CI [1.61, 0.53]), nor between "MCI" and "cognitively impaired AND depression", $p = 1.0$ (Mdiff = 0.44, 95%-CI [0.47, 1.36]) nor between "depression" and "cognitively impaired AND depression", $p = 0.108$ (Mdiff = 0.98, 95%-CI [0.11, 2.08]).

There was no significant difference in the clock drawing test for any group compar- ison: "dementia" and "MCI", $p = 0.453$ (Mdiff = 0.29, 95%-CI [0.14, 0.71]; "dementia" and "depression", $p = 1.0$ (Mdiff = 0.25, 95%-CI [0.29, 0.80]); "dementia" and "cognitively impaired AND depression", $p = 1.0$ (Mdiff = 0.22, 95%-CI [0.67, 0.22]), "MCI" and "depression", $p = 1.0$ (Mdiff = 0.03, 95%-CI [0.64, 0.57]); "MCI" and "cognitively im- paired AND depression", $p = 0.056$ (Mdiff = 0.51, 95%-CI [1.02, 0.01]), "depression" and "cognitively impaired AND depression", $p = 0.255$ (Mdiff = 0.47, 95%-CI [0.14, 1.09]).

In GDS, the group of patients with depression differed significantly from "dementia", $p < 0.001$ (Mdiff = 4.48, 95%-CI [3.1, 5.86]) as well as from "MCI", $p < 0.001$ (Mdiff = 4.76, 95%-CI [3.23, 6.29]), but not from "cognitively impaired AND depression", $p = 0.495$ (Mdiff = 1.03, 95%-CI [−0.54, 2.59]).

Discussion

In clinical diagnostics, it is of particular importance to detect dementia at an early stage and, in particular, to distinguish it from depression, especially since the two conditions are treated in a different way. Misdiagnosis in the sense of undetected dementia, because cognitive deficits are erroneously interpreted as an expression of depression, has the consequence that an early anti-dementia treatment as well as further measures indicated in the case of dementia, such as precautionary measures, etc., may be omitted.

Conversely, an erroneous diagnosis of dementia in the presence of cognitive deficits that occur in the context of depression may also lead to negative consequences in the form of overtreatment or additional psychological stress for patients and their relatives who are confronted with a dementia diagnosis that may turn out to be incorrect after treatment of the depressive symptoms. In this respect, the question is highly relevant whether and, if so, which screening and further psychological testing procedures can differentiate between dementia and depression.

Commonly used screenings, such as MMS and clock drawing tests are insufficient for differential diagnosis of dementia, MCI, and depression, a detailed NPE is absolutely required.

The results show that the MMSE in contrast to the clock drawing test can significantly differentiate between dementia and depression: Patients with dementia have a lower score. This is all the more remarkable as only test profiles with an MMSE score of 25 points or more were included in the sample. With exception of the maze test, the test procedures used in the neuropsychological examination (SKT, RBMT, WAIS) also significantly distinguish between the two diseases. Both attention performance and memory function in the SKT are poorer in dementia patients than in depressive patients, as is memory performance for complex content (RBMT) and logical structure of thought processes and the general capacity for abstraction (WAIS).The distinction between MCI and depression is even more challenging, as the cognitive impairment in MCI is often less pronounced than in dementia. The diagnosis of MCI is usually accompanied by the recommendation of annual follow-up examinations, as the risk of developing dementia is increased, but drug therapy is not indicated according to official guidelines. The screening methods MMSE and clock drawing test do not differentiate MCI from depression; in the NPE, the SKT total score (but only due to the memory subscore) and the RBMT proved to be suitable to significantly differentiate MCI from depression. Patients with MCI showed poorer memory performance, but no relevant differences to depressive patients were found with regard to attention performance.

Irrespective of the presence of depression, the differentiation of MCI from onset dementia is also an important aspect since the possibility of anti-dementia treatment is only given with a manifest dementia diagnosis, whereas MCI requires regular progress monitoring in order to detect conversion to dementia (up to 10% annually). Here, all test procedures from the NPE, as well as the MMSE, proved to be suitable to significantly differentiate between both diagnostic groups.

Conclusion

Each neuropsychological examination should yield the same result even if different procedures are used, it is up to the respective examiner to select tests that are not only suitable for the particular question, but also take into account the context (in-or outpatients, study, etc.) and specific features of the subject (age, motor or sensory limitations, etc.).

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