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Is functional mobility an independent mortality risk factor in subjects with dementia?

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ABSTRACT

Objective: To investigate whether functional mobility is a predictor of 12-month mortality in elderly subjects with dementia.

Study design: Prospective multicentre study performed in nine French university hospitals. Patients aged 75 years or more and hospitalised in medical wards via the emergency department were eligible. Those with a diagnosis of dementia were considered in the analyses.

Main outcome measures: Patients' characteristics obtained through comprehensive geriatric assessment performed during the first week of hospitalisation. Functional mobility was assessed using the timed "Up & Go" test. The main outcome was time to death within the 12 months of follow-up. Bivariable relationships between each risk factor and mortality were assessed using a Cox regression model with one explanatory variable. For multivariable analysis, the Cox regression model was used in a stepwise method after examining potential confounders and interactions.

Results: In all, 589 patients had a diagnosis of dementia, and were considered in the present analyses. Their mean age was 86 ± 6 years and most (69%) were female. The prevalence of functional mobility disorders was 86%. After 12 months, 232 (39%) had died. After adjustment for potential confounders, functional mobility was associated with a significantly higher risk of 12-month mortality (HR = 1.66; 95% CI = 1.02–2.71; p = 0.04).

Conclusions: Impaired functional mobility as assessed by the timed Up & Go test identifies subjects with dementia at risk of unfavourable outcome.

1. Introduction

Increasing age is associated with impaired performance in vestibular, muscular, visual and somesthetic systems, a decline in the speed of information transmission, and changes in the mode of information processing in the brain, all of which can lead to balance and postural disorders as well as alterations in functional mobility [1]. Indeed, 15% of subjects aged 60 years or more have gait disorders, and more than 80% beyond 85 years of age, implying increasing handicap with age [2]. Impairment of functional mobility is not only more frequent among elderly people, but is also known to be responsible for adverse events such as falls [3], and is even associated with an increased risk of death [4]. Moreover, there is also a high prevalence of dementia in the elderly population [5], and it is established that patients with cognitive impairment are at greater risk of developing gait disorders in the short to medium term [6] with a reduction of gait speed [7]. Indeed, dementia disorders are characterised by the progressive onset of cerebral lesions associated with loss of neuron cells, and a number of cerebral organisms affected by the process of dementia are also implicated in the physiology of walking [8]. Accordingly, gait disorders in patients with dementia are often associated with reduced walking speed [7], or a reduction in stride length, resulting in small steps. These dementia-related alterations in gait thus compound the natural deterioration due to ageing, resulting in a higher risk of falls [9], with more deleterious consequences in patients with cognitive impairment [10].

Although the relations between mortality and gait disorders, and

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between mortality and cognitive impairment have been widely studied [4], the relationship between mortality and functional mobility in subjects with dementia remains insufficiently documented.

Therefore, the aim of this study was to determine, using data from the SAFES ("Sujet Âgé Fragile: Evaluation et Suivi" – "Frail Elderly Subject: Evaluation and Follow up") cohort, whether functional mobility is a predictive factor for 12-month mortality in elderly subjects with dementia.

2. Methods

The SAFES cohort a prospective, multicentre study conducted in nine hospitals in France with short-stay geriatric wards.

2.1. Study population

Inclusions took place over a period of 47 weeks in nine French university hospitals. Patients aged 75 years or older who were admitted to any of the participating hospitals through the emergency department (ED) were eligible for inclusion. Patients were randomly selected from the admission lists of the ED, at a rate of 10 patients per centre per week. Participants had to be admitted via the ED to a short-stay medical unit of the same hospital. Patients who were admitted to intensive care or surgery, and those not admitted to the hospital after their visit to the ED were not eligible for inclusion. Subjects with a known prior diagnosis of dementia according to Diagnostic and Statistical Manual of Mental Disorders 4th edition (DSM-IV) criteria [11], whatever the aetiology, and who were able to perform the study tests, were included in the present analysis. Selected subjects were seen between day 4 and day 7 of their stay for initial comprehensive geriatric assessment, once the patient was clinically stable. Bedridden subjects or those with physical disabilities (loss of the ability to perform the "transfer" item of Katz's activities of daily living scale without help) or sensory disorders (sight or hearing disorders), and subjects with symptoms suggestive of delirium (according to DSM-IV criteria) were excluded.

2.2. Data collection

Socio-demographic characteristics (including age, gender, living situation, presence of a caregiver, and level of education), and data from comprehensive geriatric assessment (CGA) were collected. Functional mobility is defined as the manner in which people are able to move around in the environment in order to participate in the activities of daily living and move from place to place [12]. It was assessed in this study using the Timed "Up & Go" test (TUG) initially developed by Mathias and colleagues [13] and altered by Podsiadlo and Richardson [14]. This is a quick and simple test that requires no special equipment or specific training skills. This test can easily be implemented in routine practice. The TUG measures the time in seconds required for the subject to rise from sitting from a standard armchair, walk three meters, turn, walk back to the chair and sit down [14]. Because we cannot assume that there is a linear relationship between TUG (considered as a continuous variable) and mortality, this variable was dichotomised. Subjects were considered to have functional mobility disorders if they required more than 20 s to perform the TUG. In Podsialdo and Richardson's study [14], 20 s was the threshold that best discriminated patients for their ability for basic transfers. In addition, risk of falling was assessed using the single leg balance test [15]. The single-leg balance test assesses the ability of the subject to remain upright on one leg without support for at least five seconds. A shorter duration is considered as a failure and is associated with a twofold increase in the risk of experiencing injurious falls [15]. The level of independence at baseline was assessed using Katz's activities of daily living (ADL) scale [16]. The ADL score considered for analysis was defined as the level of independence of the subject before the occurrence of the event motivating hospitalisation (i.e. performance on ADL two weeks before admission) [16]. The participant or his/her caregiver or a close relative was questioned about the participant's ability to perform the following activities: bathing, dressing, toileting, transferring, feeding and continence. The subject was considered as dependent if he/she failed to perform the task without help for one or more ADLs. Subjects were considered as demented when there was a known history of dementia. The dementia diagnosis was ascertained by a senior physician (geriatrician, neurologist, or psychiatrist) using the DSM-IV criteria [11]. Indeed, each patient in whom the diagnosis of dementia was ascertained by a senior physician received an initial evaluation, including a medical history in search of cognitive disorders (memory impairment, aphasia, apraxia, agnosia or disturbance in executive functioning). When the patient could not respond to questions on the initial evaluation, the main caregiver was interviewed to enquire about cognitive disorders, or impaired social or occupational functioning in the patient. To exclude drug-induced cognitive impairment, a complete history of the drugs and a review of all current drugs were undertaken. In addition, each patient underwent clinical examination, mental status evaluation (when the patient's cognitive status was amenable to testing, namely Folstein's Mini-Mental State Examination (MMSE) and/or neuropsychological tests), an assessment of mood, as well as standard laboratory tests recommended in France including blood count, electrolytes (including calcium), liver and renal function tests, vitamin B12 and B9 levels, thyroid function tests, a toxicity screen (if medical history and the physical exam indicated one) and syphilis serology (depending on the medical history and the context). Finally, cerebral imaging (computed tomography (CT) scan or magnetic resonance imaging (MRI)) was performed in all patients with a confirmed diagnosis of dementia to exclude other causes of dementia syndrome (tumor, hydrocephalus, subdural hematoma…). Three levels of severity of dementia were defined according to the MMSE score, as follows: mild for a score > 20, moderate for $10 \leq$ score ≤ 20, and severe for a score < 10) [17]. The presence of mood disorders or risk of depression was evaluated using the Gilleard Scale [18]. Nutritional status was assessed using the Mini-Nutritional Assessment (MNA) [19]. Undernutrition was defined as an MNA score ≤ 17. The risk of developing pressure sores was assessed using Norton's scale, with a score ≤ 14 indicating a risk of developing pressure sores [20]. Polypharmacy was defined as the consumption of ≥ 5 drugs per day [21]. A modified version of the Charlson's co-morbidity index [22] (applicable to the Tenth revision of the International Classification of Diseases) was used to estimate co-morbidity burden. Three levels of co-morbidity were defined: low for a score of 0 or 1, medium for a score between 2 and 4, and high for a score ≥ 5. Any hospital admission within the previous three months, as well as the day of admission (weekday or weekend) was also recorded.

2.3. Ethical issues

The study was performed in accordance with the Declaration of Helsinki and current French legislation relating to biomedical research involving human subjects. The ethics committee of the University Hospital of Reims (France) approved the study. All subjects provided informed written consent. In the course of the initial interview, patients were informed about the study, prior to signing the consent form. If the clinical status and/or the cognitive status of the patient did not enable informed consent, the interviewer referred to the subject's representative.

2.4. Statistical analysis

Descriptive analysis of the socio-demographic and clinical variables was performed. Quantitative variables are described as mean ± standard deviation (SD) and qualitative variables as number (percentage). The main outcome was time to death during 12 months of follow-up. Subjects who were still alive after 12 months were censored. Those