A population-based study on the association between dementia and hip fractures in 85-year olds

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ABSTRACT. The association between dementia and hip fracture was studied in a representative sample of 85-year olds (N=485). The diagnosis of dementia was made according to the DSM-III-R. The prevalence of hip fracture was obtained by history and inspection of the hip. Bone mineral density was measured with dual photon absorptiometry of the right calcaneus. Hip fracture was associated with both Alzheimer’s disease (p<0.01) and vascular dementia (p<0.01) in women, but not in men. Among women with dementia, the rate of hip fracture was more than twice that found in the general population (32.7 % vs 13.6 %). Bone density was not associated with dementia or hip fracture. Body mass index and body weight were lower in women with dementia and in women with hip fracture. The prevalence of hip fracture was also increased in subjects who used psychotropic drugs, especially tricyclic antidepressants. A logistic multiple regression analysis showed that dementia, use of antidepressants and gender independently contributed to hip fracture. The reason why subjects with dementia are at increased risk for hip fractures may be that these subjects have a defective neuromuscular regulation, gait apraxia, use more antidepressants, and have a lower body mass index. Another explanation of the association may be that surgery and anesthesia give rise to systemic hypotension that leads to cerebral hypoperfusion and ischemic and neuronal death in vulnerable brain areas, and as a consequence may lead to dementia or worsen the symptoms in subjects already affected by dementia. (Aging Clin. Exp. Res. 8: 189-196, 1996)

INTRODUCTION

Both dementia (1) and osteoporotic fractures are common among the elderly and their incidence increases with age (2-4). Hip fracture, the most serious of the bone fragility fractures (5, 6), often leads to long-term rehabilitation, and a high risk of concomitant complications and reoperation. Apart from age and female sex (3), physical disease (7), trauma (7), decreased body weight (7, 8), institutionalization (9-12), psychotropic drug use (13-15), epilepsy (16), and Parkinson’s disease (17) have been described as risk factors for hip fractures. Dementia could also be a risk factor. Patients with dementia may have a more restricted gait pattern with imbalance, depending primarily on defective neuromuscular regulation, and predisposing to increased risk of falls and gait disturbance (18). Furthermore, they have an increased use of psychotropic drugs (19), and an increased rate of institutionalization (20). The aim of this study was to examine the association between dementia disorders and the prevalence of hip fractures.

SUBJECTS AND METHODS

All 85-year olds born between 1 July 1901 and 30 June 1902 and registered for census purposes in Gothenburg, Sweden were invited to take part in a health survey (20-23). People living in the community and in institutions were included. The study was approved by the Ethical Committee, Faculty of Medicine, University of Gothenburg.

The study was performed in three steps. A nurse first visited the subject’s home, and the subject was then invited to an examination at the geriatric outpatient clinic of Vasa Hospital. Finally, a systematic subsample, consisting of every second person from the census register, was selected for a neuropsychiatric examination; 826 subjects were visited, but 43 died before their examinations took place, leaving 783 subjects (20). Fourteen of these (1.8%) had moved or could not be traced, 229 (29.2%) declined all participation in the investigation, and 29 (3.7%) took part only in the interview with the nurse, and 29
have been described in detail previously (20). During other types of dementia. The diagnostic procedures of dementia, 64 with vascular dementia, and 14 with were diagnosed as demented (61 with Alzheimer’s diagnosis of dementia. With this procedure, 139 subjects analyses, close informant interview, laboratory tests, ECG, chest X-ray, an extensive battery of blood tests, a computed tomographic (CT) scan of the head, and a lumbar puncture. Medical records from psychiatric and geriatric institutions and outpatient departments in Gothenburg were examined by one of the authors (20).

The study included a medical and neuropsychiatric examination, interview of a close informant, neuropsychological examination by a psychologist, ECG, chest X-ray, an extensive battery of blood tests, a computed tomographic (CT) scan of the head, and a lumbar puncture. Medical records from psychiatric and geriatric institutions and outpatient departments in Gothenburg were examined by one of the authors (20).

The medical examination was performed by a geriatrician, and included an interview based on a standardized precoded questionnaire which included questions about hip fractures and life habits, e.g., smoking. All neuropsychiatric examinations were performed by a psychiatrist through a semi-structured interview in the subject’s home or at institutions, while the interview with a close informant was performed by the psychiatrist by telephone. The examinations have been described in detail elsewhere (20).

Dementia and its severity were diagnosed according to the DSM-III-R criteria (24) using information from the psychiatric examination and the close informant interview, Alzheimer’s disease according to NINCDS-ADRDA-criteria (25), and vascular dementia and other causes according to Erkinjuntti (26). Information from the physical and psychiatric examinations, close informant interview, laboratory tests, ECG, CT-scan of the head, cerebrospinal fluid analyses and case records was used in the etiological diagnosis of dementia. With this procedure, 139 subjects were diagnosed as demented (61 with Alzheimer’s disease, 64 with vascular dementia, and 14 with other types of dementia). The diagnostic procedures have been described in detail previously (20). During a house call, a registered nurse interviewed the subjects on their social and living conditions, their need of social and medical care and their drug consumption. The prescribed and actually taken dose was registered and classified according to the Anatomical Therapeutic Chemical (ATC) classification system recommended by the WHO (27, 28).

The prevalence of hip fracture was based on information from the geriatricians’ interview and from case records, and findings from the physical examination. Bone mineral density (BMD) g/cm² was measured with dual photon absorptiometry in the right calcaneum (29, 30) in a subsample of 79 men and 194 women, of whom 10 men and 25 women had dementia (response rate among non-demented subjects was 68.8%, and among demented 25.2%). The radiation sources were 125I and 57Co, and each source was regularly controlled during the seven-month period of bone measurements. The patient measurement was performed as a stationary measurement with the source and the detector collimators in close contact with the skin on either side of the heel. The point measurement was placed 4 cm from the sole of the foot, and 3.5 cm from the end of the heel; precision was found to be 1.8%. Body height and weight were measured with the subjects in their underwear. Height was recorded to the nearest cm, and weight to the nearest 0.1 kg; body mass index (BMI) was calculated as body weight (kg) divided by body height² (cm) and quotient multiplied by 10000 (31).

Statistics
Fisher’s exact test and two-tailed permutation test were used to test differences between groups (32). A non-parametric technique, based on Pitman’s test variables, was used for testing the conditional correlation between two variables when the values of the others were kept constant (33). This technique was similar to that proposed by Mantel (34). Stepwise logistic multiple regression was used to identify if dementia, use of antidepressants and gender were predictive factors for hip fractures (using the SAS computer program package).

RESULTS
Baseline data about the study population are presented in Table 1. The prevalence of hip fractures was higher among women than men (19.2% vs 8.5%, p<0.01), and higher in demented than in non-demented subjects (27.6% vs 11.6%, p<0.01) (Table 2). The latter difference only reached significance among women. The prevalence of hip fractures was increased in women with Alzheimer’s disease (31.8%,