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Clinical evidence of diabetes mellitus end-organ damage as risk factor for falls complicated by hip fracture: A multi-center study of 1225 patients

Francesc Formiga [a,*], *David Chivite* [a], *Domingo Ruiz* [b], *Margarita Navarro* [c], *J.M. Perez Castejon* [d], *Enric Duaso* [e], *Abelardo Montero* [a], *Alfonso Lopez-Soto* [c], *Xavier Corbella* [a,f]

[a] *Geriatric Unit, Internal Medicine Service, Hospital Universitari de Bellvitge-IDIBELL, L'Hospitalet de Llobregat, Barcelona, Spain*

[b] *Geriatric Unit, Internal Medicine Service, Hospital Sant Pau, IDIBAPS, Barcelona, Spain*

[c] *Geriatric Unit, Internal Medicine Service, Hospital Clinic, IDIBAPS, Barcelona, Spain*

[d] *Geriatric Unit, Hospital Sociosanitari Isabel Roig (Centres Blauclinic), Barcelona, Spain*

[e] *Geriatric Service, Hospital d'Igualada, Consorci Santiàri de l'Anoia, Barcelona, Spain*

[f] *Albert Jovell Institute for Public Health and Patients, Faculty of Medicine and Health Sciences, Universitat Internacional de Catalunya, Barcelona, Spain*

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ABSTRACT

Aims: To identify the differential characteristics of patients with type 2 diabetes mellitus (T2DM) complicated by end-organ damage who experience a fall-related hip fracture.

Methods: We analyzed the socio-demographic data and index fall clinical characteristics of a group of patients with nephropathy, neuropathy or retinopathy related to T2DM consecutively admitted to six hospitals in Barcelona, Spain because of a fall-related hip fracture.

Results: Out of 1225 patients admitted because of a fall-related hip fracture, 107 (8.7%) had clinical evidence of end-organ damage related to T2DM. Among this cohort the mean number of falls during the year prior to the index admission was 2.6 ± 3.2; and 29 of them (27.1%) had already experienced three or more falls. Most falls leading to the index admission took place at the patients' home, from a standing position, and during daylight time. An intrinsic cause of falling was identified in all but one of these patients. Multiple stepwise logistic regression analysis showed that, compared to patients without this diagnosis, patients with complicated T2DM were younger (odds ratio 0.762), had less prevalence of dementia (odds ratio 0.078), but had experienced a higher number of falls in the previous year (odds 1.183).

Conclusions: A significant amount of patients with clinical evidence of end-organ damage due to T2DM who experience a fall-related hip fracture have a history of recurrent falling in the previous year. These patients should be identified and offered preventive actions aimed at reducing their risk of falling.

* *Corresponding author at*: Geriatric Unit, Internal Medicine Service, Hospital Universitari de Bellvitge, 08907 L'Hospitalet de Llobregat, Barcelona, Spain. Tel.: +34 93 260 74 19; fax: +34 93 260 74 20.
E-mail address: fformiga@bellvitgehospital.cat (F. Formiga).

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1. Introduction

Although more than half of them cause no serious injury, falls are a common phenomenon in the elderly and may result in different types of frailty fractures [1]. Iolascon et al. [2] recently described the characteristics and circumstances of falls leading to hip fractures, the most devastating type of fall in elderly patients. Similarly, in two previously published studies, we reported the distinctive factors associated with falls causing hip fracture in a large sample of elderly patients, showing that most of them took place at home during daylight time and were related to an intrinsic factor as a cause of the fall [3,4]. In addition, our results also showed that a significant proportion of the evaluated patients had fallen three or more times during the year prior to the fracture-inducing fall [5].

While the cause of falls is often multifactorial, diabetes mellitus has been found to be a significant risk factor in several reports [6,7]. Many mechanisms contribute to a higher risk of falling in diabetic patients: peripheral neuropathy, musculoskeletal/neuromuscular deficits, foot problems, pain, vestibular dysfunction, cognitive impairment, or adverse drug reactions such as antidiabetic drugs-induced hypoglycemia. Moreover, type 2 DM (T2DM) increases not only the risk of falls, but also the risk of osteoporosis and the subsequent risk of fracture in T2DM patients [7,8]. When compared with non-diabetic patients, although bone mass seems to remain normal or even elevated in T2DM patients, bone quality – and thus bone strength – is decreased due to both micro-changes in bone architecture and material properties such as bone mineralization and the quality of collagen [9,10]. Disease duration and severity, the degree of metabolic control and the presence of complications, are also relevant contributing factors to a higher risk of fracture in T2DM patients [10]. Moreover, the use of antidiabetic drugs, especially thiazolidinediones, can also contribute to this increased risk of fracture by decreasing both bone mass and bone quality [9,10]. T2DM increases the risk of incident disability in older persons which further contributes to an increased risk of falls [11].

Given the increasing worldwide prevalence of T2DM, the above mentioned higher risk of falls and fractures among diabetic patients might become a major public health problem in the coming years, especially when considering elderly T2DM patients, who usually are more frail, and present with additional risk factors for osteoporosis [12]. We undertook this study in order to better characterize the clinical profile of the subgroup of elderly diabetic patients with more advanced disease and presumed higher risk – those suffering from T2DM already complicated with microvascular complications of the disease.

2. Material and methods

2.1. Study design and participants

The study was a multicentre investigation evaluating all patients consecutively admitted to the orthogeriatric area of six hospitals in Barcelona (Spain) and its surrounding metropolitan area (Hospital Universitari de Bellvitge, Hospital de la Santa Creu i Sant Pau, Hospital Clinic de Barcelona, Hospital Mútua de Terrassa, Hospital de Viladecans and Clínica Barceloneta) because of a hip fracture. Patient selection methods have been previously described [3–5]. Patients excluded from the study were those with fractures secondary to a high energy impact, those with spontaneous or pathological fractures, those with severe cognitive or neurosensorial impairment, and those who lacked a caregiver able to provide information.

Socio-demographic data (gender, marital status, place of residence, and type of caregiver) were collected at the time of hospital admission and all patients' past medical records and chronic medication use were assessed by direct interview and chart reviews.

2.2. Comprehensive geriatric assessment

Upon admission, the functional and the cognitive status of all patients were assessed using common instruments in geriatric practice: preadmission functional status regarding basic activities of daily living (ADL) was measured using the Barthel Index (BI) [13]; the total score of the BI ranges from 0 (fully dependent) to 100 (independent for all activities). Cognitive function – measured at the time of discharge to avoid biases caused by delirium – was evaluated using the Short Portable Mental Status Questionnaire [14]; caregivers were asked to confirm the information provided by all patients identified by this instrument as suffering from moderate or severe cognitive impairment.

2.3. Sensory assessment

Short sight vision was measured with the equivalent Snellen charts, using values lower than 20/40 at 40 cm with best eye as a cut-off; wearing glasses for near vision was also considered diagnostic of visual impairment. For hearing competence, the "whisper test" was used: patients are asked to follow commands whispered 60 cm from behind, so that the examiner's lips cannot be seen; the test is positive when patients are unable to hear the examiner [15]. We dichotomized vision and hearing difficulties to be either present or absent.

2.4. Comorbidity

Prevalent diseases and global comorbidity were assessed using the The Charlson Comorbidity Index (CCI) [16]. CCI values range from 0 to a theoretical maximum of 33, depending on the presence of certain diseases with assigned scores. Diabetes belongs in the CCI, scoring one point when end-organ damage is absent and two points when retinopathy, neuropathy, or nephropathy is present.

2.5. Fall assessment

We defined a fall as any incident in which the patient ends up on the ground or a lower level against his/her will (not due to an intentional movement). Fractures following collisions with furniture, walls or other standing structures were not considered as secondary to falling [17]. Similarly, falls due to overwhelming forces such as motor vehicle accidents or seizures were not considered for the study. Patients were