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Brief Communication

Depression and Functional Recovery after Hip Fracture in Community-Dwelling Older Adults

F. Remelli[1,2,], M.C. Ferrara[3,*], F. Triolo[2], M. Belvederi Murri[4], G. Caruso[5,6], G. Bellelli[3,7], S. Volpato[1,8], C. Trevisan[1,2,8], on behalf of the GIOG Study Group*

1. Department of Medical Sciences, University of Ferrara, Ferrara, Italy; 2. Aging Research Center, Department of Neurobiology, Care Sciences and Society, Karolinska Institutet and Stockholm University, Stockholm, Sweden; 3. School of Medicine and Surgery, University of Milano-Bicocca, Milan, Italy; 4. Department of Neuroscience and Rehabilitation, University of Ferrara, Ferrara, Italy; 5. Department of Translational Medicine, University of Ferrara, Ferrara, Italy; 6. Orthopedic and Traumatology Unit, University Hospital of Ferrara, Ferrara, Italy; 7. Acute Geriatric Unit – Fondazione IRCCS San Gerardo dei Tintori, Monza, Italy; 8. Orthogeriatrics Unit, University Hospital Sant'Anna of Ferrara, Ferrara, Italy; * These authors equally contributed to the work.

Corresponding Author: Dr. Federico Triolo, Aging Research Center, Karolinska Institutet, Tomtebodavägen 18 A, 17177 Solna, Stockholm, Sweden, E-mail: federico.triolo@ki.se, ORCID: orcid.org/0000-0002-8732-0036

Abstract

The impact of depression on functional recovery in older adults following hip fracture is unclear. We aimed to examine the association between depression and 4-month functional recovery of older inpatients with hip fracture. We conducted a longitudinal cohort study on older hip fracture patients admitted to an Orthogeriatric Unit between January 2021 and February 2022 within the multicenter "Gruppo Italiano di Ortogeriatria" network. Depression was assessed retrospectively from patient medical history. Poor functional status was a Cumulated Ambulation Score ≤4 after 4 months. The sample included 154 patients (72.1% females, mean age 81.9). A history of depression was reported in 25.3% of participants. Depression was independently associated with higher odds of poor functional outcome (OR = 2.94, 95%CI: 1.15 - 7.85). Depression predicts a poorer functional recovery after hip fracture. The identification and treatment of depression might promote better physical recovery in orthogeriatric patients.

Key words: Depression, functional outcome, orthogeriatrics, aged.

Introduction

Depression is one of the most common psychiatric disorders in old age and has been associated with several adverse outcomes, including increased risk of falls, fear of falling and disability (1). Depression might negatively influence recovery following hip fracture among older inpatients. It might reduce the adherence and motivation towards physiotherapy, as well as directly worsening motor functions (2). In addition, it is associated with an overall higher probability of prolonged and complicated hospitalizations (1). However, available evidence on this association is still conflicting (3–7). Some studies found that depression predicts a poorer rehabilitation outcome after hip fracture (4, 8), and that the persistence of depressive symptoms in the post-fracture period further strengthens this association (5). Whereas, a prospective study on 204 older hip fracture patients undergoing rehabilitation, did not detect any difference between the functional outcomes of depressed vs. non-depressed individuals (6).

The aim of this study is to examine the association between depression and 4-month functional status of older people hospitalized in a orthogeriatric ward for hip fractures.

Methods

This study used data of older patients hospitalized for hip fracture at the University Hospital of Ferrara, Italy, between January 2021 and February 2022, collected by the Gruppo Italiano di Ortogeriatria (GIOG) in their 2.0 project. The GIOG 2.0 is a prospective study aiming to improve Italian orthogeriatric care. The study protocol was approved by the Ethics Committee Brianza Institutional Review Board on April 12th, 2019, and the local Ethics Committee of Ferrara.

All patients aged ≥ 65 years, consecutively hospitalized for hip fracture were enrolled after providing written informed consent. Participants were excluded if: living in a nursing home/long-term care settings (n=10), bedridden in the pre-fracture period (n=2), died at 120 days (n=3), or had missing data on the main outcome (n=6). Of 175 individuals registered in the GIOG 2.0, 154 were included in the analytical sample.

The presence of depression at baseline was ascertained from either: a) the presence of an explicit diagnosis of depression in the medical documentation available from the patient at admission or from previous hospital records; b) the presence of antidepressant drug treatment at admission; c) a structured visit by the consulting psychiatrist from the Consultation Liaison service of the hospital. In addition, we collected baseline sociodemographic and clinical information including pre-fracture home setting, mobility capacity measured with the Standardized Audit of Hip Fracture in Europe (SAHFE) (9) classification (considering the patient autonomous if able to walk without aids or outside with only one aid), chronic diseases (arterial hypertension, cardiovascular diseases, atrial fibrillation, chronic obstructive pulmonary disease, diabetes, sensorial impairment - vision or hearing loss, osteoporosis, chronic kidney disease, neoplasia, dementia, Parkinson's disease, stroke) and medications (including antidepressant therapy), functional status (Basic Activities of Daily Living, BADLs), handgrip strength by dynamometer (cut-off: <27 Kg males and <16 Kg females), and calf circumference. Moreover, the type of fracture (intracapsular vs extracapsular) and the incidence of post-operative delirium (4AT score ≥4) were considered.

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Table 1. Baseline characteristics according to the presence of depression

	All (N = 154)	No depression (N = 115)	Depression (N = 39)	p
Age (years), mean (SD)	81.9 (7.6)	81.4 (7.7)	83.2 (7.2)	0.193
Female sex (F) , n (%)	111 (72.1)	78 (68.4)	32 (82.1)	0.153
Education (years), mean (SD)	8.5 (5.0)	9.1 (5.1)	7.2 (4.6)	0.056
Marital status (married), n (%)	60 (39.0)	47 (41.2)	13 (33.3)	0.495
Pre-hospital BADL (preserved), mean (SD)	4.6 (1.8)	4.9 (1.7)	3.8 (2.0)	0.001
Autonomy in pre-fracture ambulation*, n (%)	92 (59.7)	80 (69.6)	12 (30.8)	0.001
Chronic medications, mean (SD)	5.0 (2.8)	4.6 (2.8)	6.0 (2.8)	0.007
Antidepressant therapy				
None, n (%)	123 (79.9)	115 (100.0)	8 (20.5)	<0.001
SSRIs, n (%)	24 (15.6)	0 (0.0)	24 (61.5)	
Other antidepressants, n (%)	7 (4.5)	0 (0.0)	7 (18.0)	
Chronic diseases				
Arterial hypertension, n (%)	112 (72.7)	85 (74.6)	26 (66.7)	0.456
Cardiovascular diseases, n (%)	44 (28.2)	30 (25.9)	14 (35.9)	0.319
Atrial fibrillation, n (%)	31 (20.1)	23 (20.2)	8 (20.5)	1.000
COPD, n (%)	8 (5.2)	5 (4.4)	3 (7.7)	0.616
Diabetes, n (%)	27 (17.5)	18 (15.8)	8 (20.5)	0.666
Sensory impairment, n (%)	23 (14.9)	18 (15.8)	5 (12.8)	0.851
Osteoporosis, n (%)	25 (16.2)	15 (13.2)	10 (25.6)	0.117
CKD, n (%)	23 (14.9)	13 (11.4)	10 (25.6)	0.059
Neoplasia, n (%)	32 (20.8)	22 (19.3)	10 (25.6)	0.540
Dementia, n (%)	18 (11.7)	10 (8.8)	8 (20.5)	0.094
Parkinson's disease, n (%)	5 (3.2)	3 (2.6)	2 (5.1)	0.814
Stroke, n (%)	17 (11.0)	9 (7.9)	7 (17.9)	0.142
N. of chronic diseases, mean (SD)	2.8 (2.0)	2.6 (2.0)	3.3 (1.9)	0.067
Acute event				
Hip fracture, n (%) Extracapsular	70 (45.5)	50 (43.9)	19 (48.7)	0.734
Intracapsular	84 (54.5)	64 (56.1)	20 (51.3)	
Delirium, n (%) Preoperarative	11 (7.1)	9 (7.9)	2 (5.1)	0.424
Postoperative	43 (27.9)	30 (26.3)	13 (33.3)	0.525
Low handgrip**, n (%)	82 (55.4)	59 (54.1)	23 (59.0)	0.738
Calf circumference <31 cm, n (%)	60 (39.2)	42 (37.2)	18 (46.2)	0.424
Discharge destination, n (%)				
Home	82 (55.0)	62 (56.4)	20 (52.6)	0.964
Nursing home	10 (6.7)	7 (6.4)	3 (7.9)	
LTC	54 (36.2)	39 (35.5)	14 (36.8)	
Other hospital ward	3 (2.0)	2 (1.8)	1 (2.6)	
LOS (days), mean (SD)	10.8 (4.9)	10.7 (4.8)	10.9 (5.0)	0.676

BADLs, basic activities of daily living; SSRIs: Selective Serotonin Reuptake Inhibitors; COPD: chronic obstructive pulmonary disease; CKD: chronic kidney disease; LCT: long-term care; LOS: length of hospital stay. *Pre-fracture ambulation was assessed by SAHFE score; **Low HGS = <27Kg in males and <16 Kg in females. Number of participants with missing values in: Education=16, Marital status=6; BADL=1; Neoplasia=1; Number of chronic diseases=1; Calf circumference=1; Low HGS=6; Discharge destination=6; LOS=2.

Functional recovery was assessed at 4 months after hip fracture using the Cumulated Ambulation Score (CAS, range 0 to 6) (10) administered through phone interviews with participants or their main caregiver. The CAS evaluates the skills in "getting out of bed", "standing up from a chair" and "walking" and, for each of these, the researcher assigns 0 points if the patient is unable, 1 point if able with help, and 2 points if autonomous. A CAS score ≤4 was considered indicative of a poor functional outcome.

Table 2. Association between depression diagnosis and 4-month poor functional outcome

	Model 1			Model 2			Model 3		
	OR	**95% CI**	**p**	**OR**	**95% CI**	**p**	**OR**	**95% CI**	**p**
Depression	3.56	1.68 – 7.87	0.001	2.94	1.15 – 7.85	0.026	2.11	0.75 – 6.04	0.158
Sensitivity analysis on pre-fracture autonomous patients (N=92)*									
	Model 1			**Model 2 §**			**-**		
	OR	**95% CI**	**p**	**OR**	**95% CI**	**p**	**-**		
Depression	4.36	1.20 – 16.01	0.023	4.11	1.01 – 17.53	0.048	-		
Sensitivity analysis on dementia-free patients (N=136)									
	Model 1			**Model 2**			**-**		
	OR	**95% CI**	**p**	**OR**	**95% CI**	**p**	**-**		
Depression	3.43	1.51 – 8.18	0.004	4.64	1.59 – 14.81	0.007	-		

Model 1 is unadjusted. Model 2 is adjusted for demographic characteristics (age and sex), education, marital status, preserved BADLs in pre-hospital period, number of chronic diseases, and post-operative delirium. Model 3 is adjusted for the confounders reported in Model 2, except for BADLs that was replaced by pre-fracture SAHFE. *Pre-fracture walking ability was assessed by SAHFE, considering autonomous if the patient was able to walk without aids or with only one aid outside. §In the sensitivity analysis on pre-fracure autonomous patients, Model 2 was not adjusted for BADLs.

Statistical analysis

Baseline characteristics of the sample are presented as mean values and Standard Deviation (SD) or median and Interquartile Range (IQR) for continuous variables according to their distribution, and as counts and percentages for categorical variables. The t-test or Mann-Whitney and the Chi-square test were used to compare continuous or categorical variables, respectively. We used logistic regressions to estimate the association between depression and 4-month functional outcome, adjusting for possible confounders (age, sex, education, marital status, pre-fracture functional abilities, number of chronic comorbidities, and post-operative delirium); regarding the functional performance, Model 2 was adjusted for BADL, while Model 3 for SAHFE. A sensitivity analysis was performed on pre-fracture autonomous patients, according to SAHFE, and on dementia-free patients. The associations are reported as Odds Ratios (ORs) and 95% Confidence Intervals (95%CIs). P-value <0.05 was considered statistically significant. Statistical analyses were conducted using R (version 4.2.2).

Results

Baseline characteristics of the sample are shown in Table 1. The prevalence of depression at baseline was 25.3%. Among those with depression, 79.5% were prescribed a long term antidepressant therapy, mostly Selective Serotonin Reuptake Inhibitor (SSRIs). Participants with depression had slightly lower education levels (p=0.056), a higher number of medications (p<0.001) and worse functional and motor abilities (BADL and SAHFE scores, p=0.001) than those without depression.

Patients with depression had a higher risk of poor functional recovery in both crude and adjusted models (OR=2.94; 95%CI: 1.15–7.85), shown in Table 2. After adjusting for pre-fracture ambulation level (SAHFE), patients with depression still had a greater likelihood of poorer walking recovery, but the association was no longer statistically significant (OR=2.11; 95%CI: 0.75–6.04). However, the sensitivity analysis in 92 patients who walked autonomously before the hip fracture, showed that depression was independently associated with poorer functional outcomes (OR=4.11; 95%CI: 1.01–17.53). Finally, a sensitivity analysis in 136 dementia-free patients confirmed the independent association between depression and poor functional outcome (OR=4.64; 95%CI: 1.59–14.81); Table 2.

Discussion

We found that the depression predicts a three-fold higher odds of poor functional outcome following hip fracture, independently of age, pre-fracture functional status, number of chronic diseases, and post-operative delirium. Given its high prevalence among orthogeriatric patients (3, 4) (up to 25% in our sample), recognizing and addressing depression at admission might have a role in improving functional recovery.

Our findings align with those from another prospective study on 57 older adults with a primary diagnosis of hip fracture, where depressive symptoms at baseline predicted a lower rehabilitation outcome (4). Moreover, as reported by Mossey et al. (5), persistent depressive symptoms in the year following hip fracture further increased the likelihood of walking disability. Whereas, two other studies did not detect any significant differences in functional outcomes between depressed and non-depressed patients (3, 6). Methodological considerations, including a smaller sample size in the study by Lenze et al. (3) (58 participants), could partly explain the contrasting findings. Further, the use of the Neuropsychiatric Inventory (NPI) in Gialanella et al. (6) to assess baseline depression could have led to higher depression prevalence (double than in our study and in other reports) (7), possibly due to a lower specificity of the NPI item to detect depression (6).

In our sample, participants with depression had lower education levels, poorer pre-fracture motor ability, and a higher number of medications than those without depression. These

aspects suggest a more compromised baseline health status in depressed patients, which might, at least partially, explain our findings. On the other hand, no significant differences were observed when considering other patients' characteristics, such as age, number of chronic diseases, in-hospital delirium, and handgrip strength, well-known predictors of functional recovery. In addition, after adjustment for potential confounders, including education, BADL status, and number of chronic diseases, the association between depression and poor functional outcome remained significant, even if attenuated when including pre-fracture walking ability.

Our findings were confirmed in the subgroup of individuals who were autonomous before the hip fracture. This suggests that the effect of depression on functional outcome is independent on autonomy before fracture. In other words, our study suggests that depression may contrast the functional recovery after hip fracture, especially among older patients who were autonomous before the hospitalization.

Considering the common overlap between depression and dementia, in order to disentangle the potential confounding effect of cognitive impairment in demented patients with depressive symptoms, we performed an additional sensitivity analysis after exclusion of patients with anamnestic diagnosis of dementia. The analyses confirmed a significant association between depression and functional recovery, suggesting an independent effect of depression on the likelihood of mobility after the hip fracture.

Our findings support the routine assessment of depressive symptoms in hospitalized older patients admitted with a hip fracture. In this specific population, the healthcare professionals should administer a screening questionnaire for depression (e.g. 15-item Geriatric Depression Scale (11) or Patient Heath Questionnaire-9 (12)), tools with a high sensitivity in older age that do not require any specific training. Further, the incidence of physical disability in patients with hip fracture is extremely high and, as suggested by our findings, can be exacerbated in the presence of depressive symptoms. Therefore, the timely detection of a depressive syndrome would allow to tailor the subsequent care pathways after the hip fracture, including non-pharmacological (e.g., ad-hoc physiotherapy program, psychotherapy, and/or caregiver education) and pharmacological treatments in order to promote/maximize patients' functional recovery.

The main strengths of this study are its longitudinal design, the comprehensive multidimensional assessment of cognitive and motor performance in the pre-fracture period, and the systematic recruitment of patients admitted for hip fracture. Hence, our sample could be considered well representative of the orthogeriatric population. The findings need to be interpreted in light of the study limitations which include a single centre recruitment and the lack of a standardized diagnosis of depression. Although the clinical diagnosis was confirmed from multiple sources of information, and the prevalence was in line with the one estimated from similar populations (7), further studies should address this issue.

Conclusion

In conclusion, depression may have a strong detrimental role in the functional recovery of older people after hip fracture. The evaluation and treatment of depression should be prioritized, and always included in the multidimensional geriatric assessment to foster its management, which could in turn improve the physical recovery of orthogeriatric patients.

Authors contributions: Study conceptualization and design: FR, MCF, FT, MBM, GC, GB, SV, and CT; data curation: FR, MCF, FT, and CT; formal analysis: FR, MCF, FT, SV and CT; writing - original draft preparation: FR, MCF, FT, MBM, GC, GB, SV, and CT; writing - review and editing: MBM, GC, GB, SV, and CT.

Competing Interests: The authors declare none.

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