Functional movement disorders in neurogeriatric inpatients – underdiagnosed, often comorbid to neurodegenerative disorders, and treatable

Funktionelle Bewegungsstörungen in der Geriatrie – potentiell unterdiagnostiziert, oft mit neurodegenerativen Erkrankungen assoziiert, und behandelbar

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Abstract

Background: The proportion of patients with functional movement disorders (FMD) is high in neurology clinics. We assessed the prevalence and treatment response of FMD among geriatric inpatients at a University Hospital.

Methods: From July 2017 to November 2018, we captured the prevalence, demographic, clinical parameters, and response to treatment of FMD patients compared to non-FMD patients treated at the neurogeriatric ward of the University Hospital Schleswig-Holstein, in Kiel. Clinical endpoints were the Short Physical Performance Battery (SPPB) for mobility and the Barthel Index for instrumented activity of daily life (iADL).

Results: The prevalence of FMD was 11% (19/175), predominantly female (74%). Nine FMD patients also had a diagnosis of either idiopathic Parkinson's disease (N=7), dementia with Lewy bodies (N=1), or progressive supranuclear palsy (N=1). At admission, neither the SPPB nor the iADL differed between FMD and non-FMD patients. The treatment response was comparable between the groups: SPPB change was +0.3 (1.8) (mean, standard deviation) in FMD and +0.4 (1.9) in non-FMD ($p=0.83$); iADL change was +19 (15) in FMD and +18 (17) in non-FMD ($p=0.83$).

Interpretation: FMD prevalence was unexpectedly high in the neurogeriatric ward of a German University Hospital. There were comparable impairments and response to multidisciplinary treatment in mobility and iADL between FMD and non-FMD geriatric patients, suggesting that specific and informed treatment provided by a multidisciplinary geriatric team is effective in geriatric FMD patients. Further studies in this underdiagnosed disorder in older age are warranted.

Zusammenfassung

Hintergrund: Der Anteil von Patienten mit funktionellen Bewegungsstörungen (FBS) ist vor allem im neurologischen Fachgebiet relativ hoch. Therapeutische Optionen sind nicht konsequent entwickelt, nicht gut evaluiert und nicht validiert. Dies gilt auch für die geriatrische Klientel. Die hier vorgestellte Analyse präsentiert erste Daten zu Prävalenz und Therapieansprechen von Patienten mit FBS, die im Rahmen der frührehabilitativen geriatrischen Komplexbehandlung an einer neurologischen Universitätsklinik behandelt wurden.

Methoden: Es wurde auf der neurogeriatrischen Station des Universitätsklinikums Schleswig-Holstein Campus Kiel über den Zeitraum von Juli 2017 bis November 2018 der prozentuale Anteil von Patienten mit FBS bestimmt. Danach wurde in diesen FBS-Patienten die Mobilität (*Short Physical Performance Battery*, SPPB) und die Schwere der Beeinträchtigung der instrumentellen Aktivität des täglichen Lebens (Barthel-Index) bestimmt und mit den Daten der Nicht-FBS Patienten verglichen. Des Weiteren wurde der Therapieerfolg (Delta SPPB / Delta Barthel-Index Entlassung (T2) – Aufnahme (T1)) von stationär mit einem geriatrischen multidisziplinären Team behandelten Patienten mit FBS im Vergleich zu nicht-FBS Patienten bestimmt.

Resultate: Der Anteil von Patienten mit FBS (N=19) am Gesamtkollektiv (N=175) lag bei 11%. Der Anteil von Frauen lag bei 74%. Neun der FBS-Patienten hatten zusätzlich eine Diagnose einer neurodegenerativen Bewegungsstörung (7 idiopathisches Parkinson-Syndrom, 1 Demenz mit Lewykörpern, 1 Progressive supranukleäre Blickparese). Bei Aufnahme zeigten sich keine signifikanten Unterschiede in der SPPB oder im Barthel-Index zwischen FBS und Nicht-FBS Patienten. Mit Delta SPPB von +0.3 (1.8) versus +0.4 (1.9) (M (SD); p = 0.83) und Delta Barthel-Index von +19 (15) versus +18 (17) Punkten (p=0.83) zeigten sich keine relevanten Unterschiede hinsichtlich Therapieerfolg zwischen FBS und nicht-FBS.

Interpretation: Der Anteil von Patienten mit FBS an der Klientel auf einer neurogeriatrischen Station an einer deutschen Universitätsklinik zeigt sich überraschend hoch. Erste Analysen deuten darauf hin, dass FBS Patienten bei Zuweisung ähnlich schwer betroffen sind wie nicht-FBS Patienten, und sie von der angebotenen Struktur und Behandlung durch das multidisziplinäre geriatrische Team auch ähnlich effektiv profitieren. Dies ist aufgrund der bestehenden Literatur nicht selbsterklärend und bedarf weiterer wissenschaftlicher Aufarbeitung.

Schlüsselwörter: funktionelle Bewegungsstörung, psychogene Bewegungsstörung, Geriatrie, Aktivitäten des täglichen Lebens, Mobilität

Introduction

Functional movement disorders (FMD) belong to the spectrum of functional neurologic disorders (1). Previously referred to as “psychogenic”, this term assumed an etiology that may be relevant to some patients only (2). As a result “FMD” has gained widespread acceptance, including in the current Diagnostic and Statistical Manual to mental disorders (DSM-5) and the 11th revision of the International Classification of Diseases (ICD-11, expected for 2018/2019).

FMD prevalence is between 2% and 20% in movement disorders clinics (1,3,4). Although young adults are more commonly affected, the age spectrum is wide. About 20% of FMD patients may have the onset of FMD after the age of 60 years (5).

FMD can manifest with different movements (may be seen as “FMD subtypes”), such as tremor, dystonia, myoclonus, parkinsonism, tics, paroxysmal dyskinesia, gait disorders and other movement phenotypes (3). Disability and impairment in quality of life have been reported to be comparable to patients with neurodegenerative diseases such as idiopathic Parkinson disease (1). The diagnosis of each FMD requires the ascertainment of *incongruence* and *inconsistency* of the abnormal movements (6,7) (Table 1). Only neurologists with expertise in movement disorders can distinguish FMD from organic (often complex and bizarre) movement disorders (6). Diagnosis can be even more challenging when FMD appears in the setting of organic disorders or after a physical injury, which occur frequently in geriatric (i.e., multimorbid) patients (1,8,9).

Table 1 Building Blocks for the diagnosis of functional movement disorders

Incongruence	Inconsistency
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What does it mean?	1. Movements do not present or progress according to the wide phenotypic range of known organic movement disorders 2. Movements change or are suppressed with complex tasks ^a	1. Movements vary over time 2. Movements change or are suppressed with complex tasks ^a 3. Disability is disproportionate to objective findings
What does it require?	Extensive experience on organic movement disorders	Careful examination of changes in movement to distracting tasks or non-physiologic interventions
What does it imply?	Diagnosis can only be made by a neurologist with expertise in movement disorders	Diagnosis may require a longer period of examination and observation than for most movement disorders

^aChanges over time and suppressibility with complex tasks are also a domain of organic tics but not of most other movement disorders. According to (6).

To date there is no accepted standard protocol available for treating FMD. The treatment process generally starts with detailed diagnostic debriefing to facilitate the patient's acceptance of diagnosis (1). Physiotherapy and psychodynamic psychotherapy may be effective in at least some patients (10–12). One of the most recent studies measured the effects of a one-week physiotherapy program based on the concept of motor reprogramming on FMD in 60 patients (17 to 79 years) compared to a control group (age- and sex matched patients treated "as usual") (13). Improvement, substantial improvement or remission occurred in 74 percent of patients. Patient-rated outcomes after two years still showed 60 percent (compared to 22 percent in the control group) of patients reporting improvement, substantial improvement or remission. Interestingly, semi-stationary and stationary multidisciplinary therapy has been shown to be effective, especially in severely affected patients (14,15).

The aim of this study was to evaluate the prevalence, demographic and clinical characteristics as well as the treatment response to a multidisciplinary rehabilitation program of FMD inpatients at a geriatric ward of a neurological department in a University Hospital in Germany.

Methods

We included all participants that 1) were treated in our neurogeriatric ward at the University Hospital Schleswig-Holstein in Kiel between July 2017 and November 2018 and 2) took part in the ComOn Study (*COgnitive and Motor interactions in the Older population*), a prospective, cross-sectional, explorative observational multi-center study. The study included all multimorbid (16–18) patients treated at the ward that provided informed consent and were able to stand without personal aid for at least ten seconds and to walk at least three meters with or without walking aids. Exclusion criteria were age <60 years, deficits in consciousness (clinical diagnosis), >2 falls during the previous week (fall risk during the assessment too high), ≤5 points in the Montreal Cognitive Assessment (MoCA) test (severe dementia precluding effective communication), history of or current drug abuse (except nicotine) and corrected visual acuity <60%. The study was approved by the ethical committee of the Faculty of Medicine, Christian-Albrechts-Universität zu Kiel (No D427/17). The Declaration of Helsinki was respected. A representative proportion of 84% of all patients admitted to the ward were included in the analysis.

All participants were assessed within two days after admission (T1) and within 2 days prior to discharge (T2). During their stay, all participants received multidisciplinary care from a geriatric team with an individually adapted set of therapeutic goals depending on their needs. For the diagnosis of FMD patients we used the above-mentioned criteria (6,7) and the diagnosis was

made by a neurologist experienced in movement disorders (WM). For our inpatient treatment of FMD patients, we used the criteria recently published (19) with marginal adaptations (incongruence was defined as in Table 1 and also when functional movements were (i) distractible and (ii) (in case of gait and balance involvement) accompanied by compensation strategies indicative of physiological or even improved gait and balance performance (14)). This treatment covered the following components, which were provided by all team members and discussed during the weekly team meetings: Giving the symptoms a name (e.g. “functional movement disorder”); explain the diagnosis to the patient (e.g. “it is a software problem, a learned movement pattern”); provide information about the characteristics of the disorder (e.g. “it is real, not imagined; it is common and can be treated”); encourage self-observation; discuss the possibility of self-healing and treatment; support a relationship with experienced therapists.

Most of the patients underwent treatment in the frame of the *frührehabilitative Komplexbehandlung* (a specific instrument provided by the German health insurance system to enable early and extensive rehabilitative combination therapy of 14 to 20 days for geriatric inpatients). We report here demographic parameters (age, gender) and for the FMD patients the presence and severity of depressive symptoms using the screening tool *Depression im Alter* (DIA-S (20)), a self-reporting questionnaire with 10 items and a cut-off value of four points. For our main analyses we focused on the following parameters, Short Physical Performance Battery (SPPB) and the instrumented activity of daily life (iADL) Barthel Index. The SPPB measures physical performance and mobility aspects, i.e. balance (tandem, semi-tandem, and side-by-side stand), gait speed (walking twice four meters at a comfortable speed) and chair rise performance (five Chair-rise test, as fast as possible) on a scale from 0 to 4 each. The total score ranks from 0 to 12 and higher levels display better physical function and mobility (21). The test has been shown to be valid and reliable in older adults (ICC=0.83-0.89) (22). The Barthel index measures severity of impairment of such tasks as toilet use, eating, dressing, climbing stairs, among others. The German version used has been shown to have high inter-rater reliability (kappa = 0.93) (23,24). The maximal score is 100 with higher scores indicating better performance and a higher degree of independence in iADL.

T1 data was used to evaluate cross-sectional aspects of FMD and non-FMD patients at admission. We also evaluated whether symptoms of FMD were already mentioned by the referring doctor, whether we informed patients about the diagnosis and whether these symptoms contributed (at least indirectly) to the primary or an additional diagnosis for admission.

Response to treatment was evaluated by calculating the change between admission and discharge according to the formula, T2 (discharge) – T1 (delta, Δ) of the SPPB and the Barthel index. Data are presented as mean $\pm$ standard deviation and frequency. We used Student's t and Chi² tests for statistical group comparisons of FMD versus non-FMD, and Mann-Whitney-U test for subgroup analyses (small N). A non-corrected p-value <0.05 was considered significant in this hypothesis-generating study.

Results

Comparisons of demographic and clinical parameters between the FMD group and the non-FMD group are summarized in Table 2. The proportion of FMD patients in the total cohort was 11%.

Mean age of FMD (14 patients older than 70 years) and non-FMD patients was comparable. Females were more common in the FMD group than in the non-FMD group. At admission, neither the Barthel (iADL) index nor the SPPB differed significantly between FMD and non-FMD patients. Time between T1 and T2 as well as Δ Barthel index and Δ SPPB were comparable between groups.

Table 2 Demographic and clinical parameters: group comparisons between FMD and non-FMD patients

	FMD	non-FMD	p-value
N	19	175	
Age (M $\pm$ SD / CI) [years]	75 $\pm$ 8 (70-79)	78 $\pm$ 7 (77-79)	0.14
Females [%]	14 (74%)	71 (45%)	0.02
Barthel index (0-100) at T1 (M $\pm$ SD / CI)	58 $\pm$ 14 (51-64)	53 $\pm$ 14 (51-55)	0.85
SPPB score (0-12) at T1 (M $\pm$ SD / CI)	5.3 $\pm$ 1.9 (4.4-6.2)	5.2 $\pm$ 2.3 (4,9-5,5)	0.83
Time between T1 and T2 [days]	10.4 $\pm$ 1.8 (9.6-11.2)	11.4 $\pm$ 2.2 (11.1-11.7)	0.07
Δ Barthel index (M $\pm$ SD / CI)	19 $\pm$ 15 (12-26)	18 $\pm$ 17 (15-20)	0.83
Δ SPPB (M $\pm$ SD / CI)	0.3 $\pm$ 1.8 (-0.5-1.1)	0.4 $\pm$ 1.9 (0.1-0.7)	0.83

CI, 95% Confidence Interval; Δ (delta), difference between T1 (first assessment) and T2 (second assessment); FMD, functional movement disorder; M, mean; N, sample size; SD, standard deviation; SPPB, Short Physical Performance Battery.

The three items “Help needed with transfers” (improved in 12), “Help needed with bathing” (improved in 9) and “Help needed with clothing” (improved in 9) were the main drivers of the Δ Barthel index seen in FMD patients.

Figure 1 provides an overview of the two parameters evaluated between T1 and T2 for the FMD versus non-FMD patients.

Figure 1 Treatment response of geriatric patients with and without functional movement disorders (FMD); SPPB, Short Physical Performance Battery, reflecting mobility. The Barthel index reflects instrumented activities of daily living (iADL) performance. T1/T2 = Measurement at the admission/discharge of the inpatient stay.

None of the patients were diagnosed with FMD prior to the inpatient stay. About half of the patients were referred due to symptoms that indirectly suggested the possibility of FMD, but the diagnosis was not confirmed on examination until the hospital admission. Nine patients suffered from additional neurodegenerative movement disorders (idiopathic Parkinson's disease, IPS (25), N=7; dementia with Lewy bodies, DLB (26), N=1; progressive supranuclear palsy, PSP (27), N=1). DIAS values were relatively low (1.8 ± 2.7) suggesting that, as a mean, depressive symptoms did not relevantly contribute to the FMD symptoms. At admission, four FMD patients had anti-depressive co-medication with a selective serotonin reuptake inhibitor (SSRI) each; two patients took it during and beyond our entire treatment phase.

FMD patients with IPS (mean Levodopa-equivalence daily dose (LEDD) at T1, 614mg; Δ LEDD, 56mg) presented with tightrope walking (N=1), dragging (N=1), back- and sideward leaning of the trunk (N=1), trembling (N=1), gradual fatiguing of gait with "pre-syncope" (N=1) and "robotic" gait (N=2). The DLB patient presented with walking-on-ice and waddling gait, and the PSP patient with stiff-legged gait on the left side and severe gradual fatiguing. The 10 patients without neurodegenerative disease presented with ataxic / uncoordinated gait (N=2; one only with the left side), "give way" of the knees (N=3, one with truncal myoclonic movements), hyperkinetic movement of the left arm (N=1), scissoring gait (N=1), tremor of the upper extremities and inability to move legs (N=1), walking-on-ice gait (N=1), and marked slowness on manual tasks and variable resistance against passive movements without cogwheel rigidity (N=1).

We informed 12 patients about their FMD diagnosis during the inpatient stay. The remaining seven patients were not informed because the multidisciplinary team felt that this information

may not have been helpful for treatment at the current stage (e.g., due to complex treatment situation and risk of non-compliance). These patients still were trained in coping with FMD symptoms. There was no significantly different therapy response between the informed and non-informed FMD patients (Δ SPPB, $p=0.39$; Δ Barthel index, $p=0.12$). At discharge, eight patients had a primary diagnosis of FMD; 11 patients had a different primary diagnosis and FMD was listed as additional diagnosis. There was no significantly different therapy response between patients with primary / additional FMD diagnosis (Δ SPPB, $p=0.23$; Δ Barthel index, $p=0.72$).

Discussion

The prevalence of FMD was surprisingly high in an inpatient neurogeriatric setting, an observation not previously reported. Remarkably, half of the FMD diagnoses were uncovered in patients with established neurodegenerative disorders, a level of co-occurrence in the high end of the previously reported range (28). While this finding will need to be reexamined in independent cohorts, it supports that FMD are common in the elderly, occurring in isolation (5) or complicating other neurodegenerative disorders (9). Physicians treating geriatric patients with movement disorders need to be alert as to the possibility that FMD may be the predominant source of disability.

Interestingly, FMD patients did not significantly differ from our geriatric non-FMD patients at admission regarding age, physical function and mobility (SPPB) and iADL (Barthel index, Figure 1). As consistently reported (29), the majority of our geriatric FMD participants were females. It must be considered that FMD diagnosis is more challenging in geriatric than in non-geriatric patients, given the comorbidities, including additional neurodegenerative movement disorders, as in half of our cohort. This finding underscores the relevance of the criterion “reliable diagnosis can only be made by a neurologist with expertise in movement disorders” (6). Geriatricians and neurologists are encouraged to work closely together to design and implement an efficient diagnostic approach. Fortunately, the new diagnostic criteria for FMD (6,30) allow a “positive” diagnosis and should replace a diagnosis based on exclusion of organic diseases that is, at least in our experience, often not helpful and does not assist the treatment goals and strategy.

Our analyses show that FMD patients benefit comparably well to non-FMD patients from the geriatric multidisciplinary team approach provided at the neurogeriatric ward, suggesting that this approach is an effective treatment option using published recommendations (14,19). In more detail, changes of the Barthel index and the SPPB values were similar in both groups. In our cohort, this held true for patients 1) with and without additional movement disorders, 2) with and without primary FMD diagnosis at discharge and 3) with and without being informed about the FMD diagnosis. The last aspect is surprising as, according to current recommendations, providing information about FMD to the patient is a central part of effective treatment. We can only speculate that, in geriatric, multimorbid patients, a specific and goal-oriented multidisciplinary geriatric team treatment approach can still lead to a relevant improvement in the outcome parameters due to, e.g., significant improvement of symptoms in the non-FMD diagnoses. Another reason could be that the outcome parameters used in this study are nonspecific and/or that our FMD subgroups were too small to reach significance.

Still, we feel that our pilot results are promising for a disorder that is short on evidence-based treatments to date (1,10–13) and is associated with poor prognosis in a high proportion of those affected (3,15). Based on the observations coming from this pilot study, future studies could use a (more) standardized assessment and treatment regime and collect data over longer time periods. These studies may also include outcome parameters beyond Barthel index and SPPB, such as health-related quality of life and (real life) activity and mobility parameters, to allow the generalizability of treatment effects.

In conclusion, FMD diagnosis was common in our neurogeriatric ward at the University Neurology department and should be considered in geriatric patients presenting with movement disorders with or without associated neurodegenerative disorders. Preliminary analyses suggest that the geriatric multidisciplinary team approach with consequent implementation of published recommendations is an effective treatment option. Further studies are necessary to improve our understanding of the epidemiology and diagnostic aspects of FMD in geriatric patients, and to develop standardized and validated treatments.

Conflict of interest

The corresponding authors confirms that none of the authors has a conflict of interest concerning the data and the manuscript presented here.

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