Original Article

Similarities and Differences in Functional Movement Disorders and Functional Seizures at a Tertiary Care Center: A Prospective Study

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Abstract

Background: Functional movement disorders (FMDs) and functional seizure (FS) are the two most important subcategories of functional neurologic disorders (FNDs). **Objectives:** This study aimed to discern similarities and differences between patients with FMD and FS. **Methods:** A prospective comparative study of 94 patients with FNDs (FMD = 47, FS = 47) was conducted. **Results:** Tremor and pauci-kinetic attack with preserved responsiveness were the most common subtypes observed in patients with FMD and FS, respectively. A significantly higher number of patients with FMD had more than one precipitating factor ($P = 0.03$). Headache was significantly more common in patients with FS ($P = 0.03$). More patients came for follow-up in the FMD group ($P = 0.01$). More patients in the FS group reported "very much improvement" ($P = 0.04$), and "no change" was more commonly reported by the FMD group patients ($P = 0.009$). **Conclusion:** Emotional stress was the most common precipitating factor in patients with FMD and FS. The prognosis was better in patients with FS.

Keywords: Functional movement disorder, functional seizure, tremor

Introduction

Functional movement disorders (FMDs) and functional seizure (FS) are among the most common subtypes of functional neurologic disorders (FNDs).[1] FMDs can be hyperkinetic or hypokinetic.[1,2] Common hyperkinetic FMDs include tremor, dystonia, myoclonus, tics, and gait disorders, whereas functional slowness and weakness are hypokinetic.[1-3] However, FS is a paroxysmal event that may resemble epileptic seizures without having ictal correlates on electroencephalogram (EEG).[2] Usually, FMDs and FS are investigated and managed separately by different neurology subspecialties.[4,5] However, they share many similarities.[6,7] For instance, the onset of "illness" in both these groups is quite abrupt with a lot of variability and distractibility.[8] Also, the basic scaffold of the genesis of both FMD and FS remains similar, with a history of some form of psychiatric insults such as trauma, significant life events, or abuse serving as the inciting factor.[9] Furthermore, in a clinical setting, both FMD and FS have similar age and sex distribution and a high rate of chronic pain.[6] In other words, the blurred clinical differences between these two disorders give rise to a peculiar situation in the mind of the clinician whether to lump them or split them.[6]

Despite many similarities and differences existing between FMD and FS, studies comparing them are scarce and majority of them are retrospective chart reviews with no follow-up data.[10-12] In this prospective study, we have compared the demographic, clinical, and follow-up data of patients with FMD and FS.

Methods

The study was conducted at a tertiary care teaching institute after obtaining approval from our institutional ethics committee. We prospectively evaluated 94 consecutive patients with FNDs attending our movement disorders clinic and fulfilling the inclusion criteria of the study (Fahn–Williams criteria for FMD and LaFrance criteria for FS).[13,14] The diagnosis of FND was made by a neurologist with a fellowship in Parkinson's disease and movement disorder. All enrolled patients signed an informed consent.

Patients with FS were further classified into different phenotypes as per the Hubsch criteria.[15] Video recordings (3–5 min) were taken for all patients with FMD, and a video EEG (32 channel made by Natus) was performed for all patients with FS. All video EEG findings were evaluated by the neurologist.

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In addition to demographic details, data regarding the phenomenology, antecedent illnesses, and precipitating factors were also collected. All patients received treatment with counseling, cognitive behavioral therapy, and pharmacotherapy with consultation from the psychiatry department. At the end of 6 months of treatment, patients' perspectives regarding their resolution of symptoms were assessed using the "patient global impression of change" (PGIC) scale (range: 1–7).[16]

The data were analyzed using the Statistical Package for the Social Sciences software version 21. Values were expressed as mean ± standard deviation (SD) and as percentages and ranges. The mean between the two groups was compared using the *t*-test and frequencies between various groups were compared using the χ^2 test. *P* values ≤ 0.05 were considered statistically significant.

Results

We prospectively evaluated 94 consecutive patients with FNDs (FMD: 47, FS: 47) over 18 months. Table 1 gives a comparison of demographic, clinical, and follow-up data of patients with FMDs and FS.

Functional movement disorders

A total of 47 patients had FMD as the manifestation of FND. All these patients were "documented" as per the Fahn–Williams criteria.[3] Mean ± SD age of our FMD cohort was 34.38 ± 15.78 (range: 9–75) years, and the majority (68.08%) of them were females. Most patients (59.57%; 28/47) presented to us with chronic symptoms (>6 months). Although most (80.85%) FMD patients presented in the outdoor patient department (OPD), a large number of patients with functional speech, gait, and weakness presented in the emergency room (ER). Most of the FMD patients were those with tremor (46.21%), followed by gait abnormality (21.27%). The average tremor frequency of our functional tremor group was 7.88 ± 2.17 Hz with a range of 6–10 Hz. The third most common FMD in our study was craniofacial movement disorders. Dystonia and speech abnormality were seen in equal numbers, whereas chorea, weakness, and tics were less common. Most patients with FMD reported emotional stress of some kind as the possible harbinger of their illness. The most frequent coexisting medical comorbidity was headache and the most common psychiatric comorbidity was depression in this group. Almost all but one patient turned out for follow-up after 6 months. As per the PGIC scale, 36.95% of them reported very much improvement and 30.43% of them reported no change in their symptoms. None of the patients with FMD reported worsening of symptoms.

Functional seizure

A total of 47 of our patients had FS as the sole manifestation of FND in our study. The mean ± SD age of our patients was 29.89 ± 12.55 (range: 12–56) years, and the majority (74.46%) of them were females. Eighty-one percent of patients with FS presented in the OPD, whereas 19% of them presented in the ER; most of these patients had a symptom duration of >6 months. The mean duration of the diagnosis of FS in our study was 1.71 years, with the duration of symptoms ranging from 3 days to 15 years. As much as 65.95% of patients in our FS cohort had a single type of precipitating factor, and 4.22% of our patients had a history of coexistent true seizures. Majority (44/47; 93.61%) of these patients closed their eyes during the episode and had a long duration (mean ± SD: 627.38 ± 1032.06 days [range: 3 days–15 years]) of paroxysmal symptoms unlike that of true seizures. Moreover, most (38/47; 80.85%) of them said that they could recall what was going on around them during those events. When LaFrance criteria were applied for the diagnosis, the majority (76.59%) were documented, 14.89% were clinically established, and 8.51% fit into the "possible" criteria.[4] As per the Hubsch criteria, the majority (44.68%) presented with pauci-kinetic attack with preserved responsiveness; pseudo-syncope type (40.42%) was the second most common type and dystonic attack with primitive gestural activity (8.51%) was the third most common type.[5] Depression and anxiety were found to be the most common psychiatric comorbidities in this group, whereas headache remained the most common medical comorbidity. During follow-up visits after 6 months, as per the PGIC scale, the majority (58.97%) reported very much improvement, 28.20% reported much improvement, 5.12% reported minimal improvement, and 7.69% reported no resolution at all. No patient who could make it for the follow-up visit reported worsening of their symptoms.

Comparison of patients with FMD and FS

When we compared the FMD and FS groups, we found some interesting observations. More than one precipitating factor was present in a significantly higher number of patients with FMD ($P = 0.03$). The absence of psychiatric comorbidity was more common in the FMD group ($P = 0.03$). However, headache as a concomitant medical comorbidity was more common in the FS group ($P = 0.03$). More patients in the FMD group came for follow-up ($P = 0.01$). When patients' perspectives at 6-month follow-up were assessed using PGIC, more patients in the FS group reported "very much improvement" ($P = 0.04$), whereas more patients in the FMD group reported "no change" ($P = 0.009$).

Discussion

In our prospective comparative study of 94 patients with FNDs, tremor and pauci-kinetic attack with preserved responsiveness were the most common subtypes observed in patients with FMD and FS, respectively.

Studies that directly compared patients with FMD and FS found that the clinical similarities between these conditions far exceeded their differences [Table 2].[10-12] However, two of these studies were retrospective and follow-up data assessment was not done.[11,12] In our study, there were many similarities and differences between the patients with FMD and FS.

Similar to other studies, there was a high female preponderance in our patients.[3,6-10] Majority of our patients presented in

Table 1: Comparison of demographic, clinical, and follow-up data of patients with functional movement disorders and functional seizure

Comparative variables	Functional movement disorders	Functional seizure	*P*
Number of patients	47	47	
Gender (males:females)	15:32	12:35	0.46
Children	11 (23.40%)	14 (29.78%)	0.48
Adults	34 (72.34%)	33 (70.21%)	0.81
Elderly	2 (4.25%)	0	0.49
Age, mean ± SD	Mean: 34.38±15.78 years	Mean: 29.89±12.55 years	0.13
Setting of presentation	OPD: 38, emergency: 9	OPD: 38, emergency: 9	
Duration of illness	Mean: 733.10±1471.73 days (range: 1 day–26 years)	Mean: 627.38±1032.06 days (range: 3 days–15 years)	0.68
<1 month	7 (14.89%)	7 (14.89%)	1.00
1–6 months	12 (25.53%)	16 (34.04%)	0.36
>6 months	28 (59.57%)	24 (51.06%)	0.68
Phenomenology	Limb tremor (*n*=22; 46.80%), gait abnormality (*n*=10; 21.27%), craniofacial FMD (*n*=7; 14.89%), speech abnormality (*n*=5;10.63%), dystonia (n=5; 10.63%), chorea (*n*=3; 6.38%), weakness (*n*=2; 4.25%), tics (*n*=1; 2.12%), tremulous abdominal movements (*n*=1; 2.12%), generalized body tremulousness with abnormal vocalization (*n*=1; 2.12%)	Pauci-kinetic attack with preserved responsiveness (*n*=21;44.68%), pseudo-syncope (*n*=19; 40.42%), dystonic attack with primitive gestural activity (*n*=4; 8.51%), axial dystonic prolonged attack (*n*=3; 6.38%)	
Nature of possible precipitating factors			
Emotional stress (interpersonal relationship conflicts, grief or bereavement, lack of emotional fulfillment due to some reason, role of caregiver due to illness in the family)	35 (74.46%)	27 (57.44%)	0.81
Financial constraints	16 (34.04%)	10 (21.27%)	0.16
Physical injury or acute illness	2 (4.25%)	2 (4.25%)	1.00
Not disclosed by the patient	9 (19.14%)	11 (23.40%)	0.61
Number of precipitating factors			
Single	25 (53.19%)	31 (65.95%)	0.20
More than one	13 (27.65%)	5 (10.63%)	**0.03**
None	9 (19.14%)	11 (23.40%)	0.61
Secondary gain			
Acknowledged by the patient	7 (14.89%)	11 (23.40%)	0.29
Not acknowledged by the patient	40 (85.10%)	36 (76.59%)	
Associated medical comorbidity			
Headache	16 (34.04%)	7 (14.89%)	**0.03**
Hypertension	1 (2.12%)	4 (8.51%)	0.16
Stroke or cardiac problems	0	4 (8.51%)	0.11
Co-existent organic seizure disorder	2 (4.25%)	6 (12.76%)	0.72
Associated concomitant organic movement disorder	4 (8.51%) (Idiopathic Parkinson's disease=1, hemifacial spasm=1, post-stroke cervical dystonia=1, antipsychotic-induced cervical dystonia=1)	3 (6.38%) (Idiopathic Parkinson's disease=2, drug-induced bilateral upper limb tremors=1)	0.13
Other associated organic illnesses	5 (10.63%) (Diabetes=1, congenital torticollis=1, congenital tongue-tie=1, occipital glioma=1, mental retardation=1)	2 (4.25%) (Left infantile hemiplegia=1, hypothyroidism=1)	0.30
Other nonspecific somatic symptoms	3 (6.38%) (Atypical chest pain=1, bilateral ear pain=1, backache=1)	3 (6.38%) (Dry cough=1, multiple somatic complaints=1, ill-localized abdominal pain=1)	1.00
None	22 (46.80%)	25 (53.19%)	0.53
Number of associated medical comorbidity			
Single	20 (42.55%)	17 (36.17%)	0.52
More than one	6 (12.76%)	5 (10.63%)	0.74
None	21 (44.68%)	25 (53.19%)	0.40

Contd...

Table 1: Contd...

Comparative variables	Functional movement disorders	Functional seizure	*P*
Associated psychiatric comorbidity			
Depression	14 (29.78%)	16 (34.04%)	0.65
Anxiety	13 (27.65%)	16 (34.04%)	0.50
Auditory hallucinations	2 (4.25%)	0 (0.00%)	0.49
Panic attacks	1 (2.12%)	2 (4.25%)	0.55
OCD	1 (2.12%)	1 (2.12%)	1.00
Thanatophobia	0 (0.00%)	1 (2.12%)	1.00
Bipolar disorders	1 (4.25%)	0 (0.00%)	0.55
Temper tantrums	1 (4.25%)	0 (0.00%)	1.00
Unclassified pervasive mood disorder	0 (0.00%)	1 (2.12%)	1.00
Number of associated psychiatric comorbidity			
Single	11 (23.40%)	17 (36.17%)	0.17
More than one	13 (27.65%)	17 (36.17%)	0.37
None	23 (48.93%)	13 (27.65%)	**0.03**
Follow-up	46 (97.87%)	39 (82.97%)	**0.01**
Outcome[a]	*n*=46	*n*=39	
Very much improved (1)	17/46 (36.95%)	23/39 (58.97%)	**0.04**
Much improved (2)	8/46 (17.39%)	11/39 (28.20%)	0.23
Minimally improved (3)	7/46 (15.21%)	2/39 (5.12%)	0.13
No change (4)	14/46 (30.43%)	3/39 (7.69%)	**0.009**

FMD=Functional movement disorder, OCD=Obsessive compulsive disorder, OPD=Outdoor patient department. [a]As measured by "patient global impression of change". Bold values are statistically significant *P*<0.5

Table 2: Studies comparing patients with functional movement disorders and functional seizure

	Grimaldi 2009[4]	Driver-Dunckley 2011[5]	Hopp 2012[6]	Present study
Objective	Compared anxiety and depression in patients presenting with PNES with those suffering from PMD	To find out any clinically relevant differences between PNES and PMD	To compare demographic, clinical, and psychologic profile of patients with PNES and PMD	To discern similarities or differences between patients with FMD and FS
Study type	Clinically descriptive, prospective study	Retrospective chart review	Retrospective study	Prospective cohort study
Number of patients	17 (FMD: 8, FS: 9)	172 (FMD: 56, FS: 116)	139 (FMD: 104, FS: 35)	94 (FMD: 47, FS: 47)
Major findings	Similarities: Both patient groups had similar demographic and clinical data as well as depression and personality disorders Differences: In patients with PNES, there was a trend toward an increased prevalence of a familial medical history of epilepsy and a higher incidence of anxiety disorders	Similarities: Female gender (82%), abuse history (45%), chronic pain (70%), depression (42%), subjective fatigue (47%), subjective cognitive complaints (55%), referral for psychiatric evaluation (54%) Differences: PNES: younger, lower level of education, intermittent symptoms, associated with altered consciousness and childhood abuse PMD: More anxiety	Similar psychologic profile: Reduced SF-12 physical health and mental health summary scores and increased BSI somatization, depression, and anxiety ratings Differences: Age (patients with PMD were older), gender (more patients with PNES were females), and clinical manifestations (patients with PNES had more episodic symptoms, altered consciousness, and convulsive episodes; patients with PMD had more unilateral symptoms)	Similarities: Younger age, female preponderance, setting of presentation (more in OPD setting), majority of the patients had chronic symptoms, and emotional stress was the major precipitant Differences: FMD: More than one precipitating factor, more likely to have absence of psychiatric comorbidities, more patients came for follow-up and more patients reported no change in their symptoms FS: Headache was more common, and more patients reported "very much improvement"

FMD=Functional movement disorders, FS=Functional seizure, PMD=Psychogenic movement disorders, PNES=Psychogenic nonepileptic seizures, OPD=Outdoor patient department, SF-12=12-Item Short Form Survey, BSI=Brief symptom inventory

OPD settings and they had a long duration (>6 months) of symptoms. Tremor was the most common phenomenology in our patients with FMD, followed by gait abnormality, craniofacial movements, speech problems, and dystonia. None of our patients had myoclonus or parkinsonism, which have been reported in other studies with variable frequency.[1] Based on the classification proposed by Hubsch *et al.*,[15] majority of our patients had a pauci-kinetic attack with preserved

consciousness and pseudo-syncope (n = 19). Only 8.51% of our patients had a dystonic attack with primitive gestural activity, which is contrary to the finding of Hubsch *et al.*, who reported this phenotype to be the most common (31.6%) in their cohort.

Emotional stress, financial constraints, and physical illnesses were the most common precipitating factors in both groups. More than one precipitating factor was significantly more common in patients with FMD compared to patients with FS. The nature of possible precipitating factors was not disclosed by 19.14% of patients with FMD and 23.40% of patients with FS. A similar observation was reported in our previous study, where majority of the adults with FMD had familial stress (42.42%) and financial stress (18.18%) as the precipitating events.[17] Interestingly, emotional stressors reported by our patients were mostly related to family problems, which is quite common in this part of the world where the tradition of a joint family is still popular. In other published studies, a history of sexual, emotional, or physical abuse has been reported in up to 50% of patients with FS and 19% of patients with FMD.[6,7] In one comparative study, it was found more frequently in FS than in FMD (31% vs. 16%, respectively, $P = 0.03$).[18] However, none of our patients reported a history of sexual abuse. It is possible that many patients did not share this information due to social taboos; also, our questionnaire did not specifically address this issue. Furthermore, it is quite possible that since the majority of our patients live in more protected environments (with families), the incidence of such abuse is less compared to societies where people often live individually. Depression and anxiety were the most common psychiatric comorbidities observed in our patients with FMD and FS. Our findings are consistent with those of Hopp *et al*.,[12] who reported a similar psychologic profile about depression, anxiety, or other somatization. In contrast, Driver-Dunckley *et al*.[11] found anxiety to be more frequent in patients with FMD compared to patients with FS. In our cohort, patients with FMD were more likely to have an absence of psychiatric comorbidities.

Headache was the most common medical comorbidity; it was significantly more prevalent in patients with FS than in those with FMD. Our study findings are contrary to another comparative study reported by Driver-Dunckley *et al*.,[11] in which no difference was found between patients with FMD and FS concerning chronic pain syndrome (67% vs. 75%, $P = 0.3$). However, considering the retrospective nature of this study, there was an inherent risk of incomplete or inconsistent data collection. In our study, significantly more patients with FMD came for follow-up; also, more patients reported no change in their symptoms. In contrast, more patients with FS reported "very much improvement" in their symptoms. Our findings are significant and indicate a better prognosis in patients with FS compared to those with FMD.

The findings of our study have some important limitations. Firstly, our institute is a tertiary care center. Hence, the phenomenological spectrum of our FND cohort may not be a true reflection of the cases seen at the community level. Secondly, some of the patients could not come for follow-up, and this may have influenced the comparative data. Thirdly, we did not collect data regarding relieving/aborting maneuvers, causes/triggers and factors aiding improvement, and the extent of acceptance of the diagnosis and its relationship with improvement. Also, data regarding the family size of patients and the role of family members in improvement were not collected at follow-up.

Conclusion

Our study demonstrated that there was a profound overlap between FMD and FS, but overall, the prognosis was better in patients with FS. Prospective studies of these two groups using standardized evaluation and psychiatric assessments will help to better elucidate the nature and improve our understanding of the pathophysiology of these disorders.

Ethical compliance statement

The authors confirm that the study was approved by the institutional ethics committee of Maulana Azad Medical College and associated hospitals.

Authors contributions

Research project: A. Conception, B. Organization, C. Execution;

Statistical Analysis: A. Design, B. Execution, C. Review and Critique;

Manuscript Preparation: A. Writing of the first draft, B. Review and Critique

Anumeha Mishra: 1A, 1B, 1C, 2A, 2B, 2C, 3A, 3B, 3C

Sanjay Pandey: 1A, 1B, 1C, 2A, 2B, 2C, 3A, 3B, 3C

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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