ORIGINAL ARTICLE

Abnormal Eye and Cranial Movements Triggered by Examination in People with Functional Neurological Disorder

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ABSTRACT

The diagnosis of functional neurological disorder (FND) relies on the demonstration of positive symptoms and signs, as supported by recent changes in DSM5. We recorded the findings of routine clinical eye movement assessment in 101 consecutive new patients with FND. Clinical examination triggered facial and eye movement disorders in 46% of patients, all with positive characteristics of functional movement disorder. These are useful as supporting features in making a positive diagnosis of FND.

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Introduction

A key feature of functional neurological disorder (FND), particularly evident in those with functional movement disorders, is the negative impact of attention towards the body or towards movement, for example during physical examination. This is well illustrated by Hoover's sign: hip extension is weak when deliberately attempted upon request, but is normal when triggered automatically by contralateral hip flexion. Such signs, amongst other symptoms and signs, form the basis for a positive diagnosis of FND, moving away from a diagnosis of exclusion ("it must be FND because all tests are normal") or a diagnosis made on the basis of co-morbidities ("it must be FND because the patient has experienced trauma").

We have frequently observed the emergence of new symptoms and signs seemingly triggered by the act of neurological examination, and had the impression that these were most commonly seen when assessing eye movements. Functional eye and facial movement disorders can present, either as an isolated disorder or as a part of a cluster of functional neurological symptoms.^{1,2} The concept

of a "casual eye movement examination" has been put forward to aid categorization of eye movement disorders as functional or not – here abnormalities are present on direct examination, but normalize (perhaps just transiently) while the patient is observed during history taking or other tasks.

A retrospective review of a cohort attending neuro-otology clinics reported functional eye movement disorders in 1–4% of patients.³ They highlighted the frequent coexistence of functional eye movement disorder with other forms of functional movement disorder (FMD). Another retrospective study reported coexisting functional eye movement disorder in 6% of a cohort of patients with FMD.⁴

Here, we report a consecutive case series relating to the prevalence and phenomenology of "examination-triggered" eye and cranial movement disorders in people with FND.

Methods

We prospectively recorded visual symptoms and findings on eye movement examination of consecutive new patients attending the FNDs clinical

service at St George's University Hospitals. Given the nature of our clinics (linked closely to the movement disorders team) the majority of the patients had a FMD.

The data were collected as part of routine clinical assessment, which includes casual observation of eye movement during consultation and formal examination of saccades, smooth pursuit and vergence, and therefore this project was not subjected to ethical committee review.

We excluded follow-up patients and those patients with other conditions known to cause abnormalities on eye movement examination. We only included new patients with a final diagnosis of a FND.⁵

Results

We collected data from 108 consecutive new patients diagnosed with FND from our joint clinics (ME, TT and MY).

We included 101 patients in our final analysis. Seven patients were excluded because an FND diagnosis was not sufficiently certain (below the level of clinically definite⁵; two patients) or because they had coexisting neurological disorders known to cause eye movement abnormalities (five patients).

The median age was 40 [interquartile range 31–51]. There were 76 females (75.3%).

A form of FMD was present in 92.1% patients, non-epileptic attacks in 16.8%, functional sensory symptoms in another 16.8% and a primary complaint of functional cognitive symptoms in 7.9% (Supplementary Materials).

A coexisting psychiatric diagnosis was present in 38.6% [such as anxiety (24.8%) or depression 27.7%]]. Chronic/recurrent pain of any type was present in 68.3% and fatigue in 40.6% patients (Supplementary Materials).

Visual symptoms were reported by 12.9% patients before formal examination, including blurred vision in 12.9% and double vision in 5%.

On “casual” *observation* before formal examination only 10.9% showed abnormal eye movements, consisting in oscillatory eye movements in 3% (including one case of voluntary nystagmus) and increased eye blinking in 7.9%. In all of these cases there were associated features supporting a diagnosis of a functional eye movement or cranial

movement disorder, including distractibility elicited by additional manoeuvres.

In contrast to casual observation, *formal neurological examination* detected eye movement abnormalities in 45.5% patients. Saccades were abnormal in 42.6% and smooth pursuit movement in 36.6%.

Effortful facial expression and other responses (e.g. frowning, grimacing, effortful breathing) (26.7%) and/or excessive blinking (38.6%) predominated, with at least one of them being present in 40.6% patients of our cohort. They were the most frequent abnormalities during the assessment of saccadic and smooth pursuit movements (Table 1). Other relatively common abnormalities ($\geq 10\%$) included increased latency of saccades (14.9%) and tonic gaze deviation (13.9%).

Formal eye movement examination also triggered new *symptoms* in 34.7%, most frequently dizziness (26.7%), pain (8.9%) or blurred vision (7.9%).

Finally, we dichotomized our cohort according with the presence/absence of abnormal eye and cranial movements triggered by examination. After correcting for multiple comparisons (Bonferroni), none of the differences in demographics, FND manifestations and comorbidities was significant (Supplementary Materials).

Discussion

We found that functional eye movement and facial movement abnormalities were common in a group of 101 consecutive patients with FND (46%), most of whom had a FMD affecting limbs or gait. Importantly, the rate of eye/facial movement symptoms reported by patients was relatively low (13%) as was the rate of eye/facial movement signs seen during “casual” observation (16%). Thus, we found a prominent triggering of new symptoms and signs affecting the eyes and face by the act of physical examination. These included an effortful facial expression during eye movements, tonic gaze deviation, saccadic delay or convergence spasm, amongst others.

We suggest that these findings are useful on both a clinical and pathophysiological level. Clinically the contrast between findings on casual observation and formal examination provides evidence for internal inconsistency, which is a defining feature of FND.

Table 1. Abnormalities detected on formal eye movement examination of patients with FND.

Saccadic Eye Movement Assessment	Number (%)*
Any Abnormality	43 (42.6%)
Excessive blinking	37 (36.6%)
Effortful facial expression	24 (23.8%)
Increased latency	15 (14.9%)
Tonic gaze deviation	11 (10.9%)
Limited range	2 (2%)
Absent frontalis corrugation on attempted upgaze	2 (2%)
Other	7 (6.9%)
Smooth Pursuit Assessment	
Any Abnormality	37 (36.6%)
Excessive blinking	28 (27.2%)
Effortful facial expression	19 (18.8%)
Tonic gaze deviation	10 (9.9%)
Gaze distractibility/impersistence	7 (6.9%)
Limited range	3 (3%)
Absent frontalis corrugation on attempted upgaze	1 (1%)
Other	4 (4%)
Other eye movement abnormalities	
Any	10 (9.9%)
Convergence spasm	9 (8.9%)
Functional opsoclonus	1 (1%)
Symptoms triggered by eye movement examination	
Any	35 (34.7%)
Dizziness	27 (26.7%)
Pain	9 (8.9%)
Blurry vision	8 (7.9%)
Double vision	2 (2%)
Tinnitus	1 (1%)
Worsening of eye blinking	1 (1%)
Worsening of functional opsoclonus	1 (1%)

(*)_All percentages are relative to the whole cohort of 101 patients.

Furthermore, it is important for clinicians to be aware of this phenomenon, and not to misinterpret it as a sign of an “organic” eye movement disorder, hence distracting from the diagnosis of FND. This issue highlights the importance of the casual eye movement (and in fact casual general) examination in diagnosis of FND. This can take additional time in the consultation, but can provide essential positive findings to help improve diagnostic confidence in FND.

Pathophysiologically, the triggering of new symptoms and signs through physical examination fits very well with the central role for attentional diversion towards the body and towards the “mechanics” of movement proposed in pathophysiological models of FND. The effortful nature of performance of quite simple tasks in physical examination was a common feature of many of the eye and cranial movement problems we saw in our cohort. We often observe an effortful facial expression when patients with FMD perform other seemingly simple motor tasks upon

request, such as finger tapping. We relate this excessive effort during deliberate task performance with an abnormal “attentive” mode of motor control where attention is directed towards movement mechanics and away from its goal. Significantly, in cognitive processes, a *controlled* operational mode requires more effort than an *automatic* operational mode.⁶ This links to other clinical signs that have been reported in FMD, for example the “huffing and puffing” sign in some people with functional gait disorder.⁷

Functional tonic gaze deviation was present in 13.9% of our cohort. This is higher than the frequency of 3.8% reported by a retrospective study of a cohort with FMD.⁴ Functional tonic gaze deviation (functional oculogyric crisis) is proposed to describe a sustained (usually upward) gaze that is distractible but not suppressible by volition. In contrast, in organic oculogyric crisis gaze always deviates upwards and it is suppressible by volition.¹ In our cohort, tonic gaze deviation was always triggered by formal movement examination: saccadic or smooth pursuit movements performed upon request were followed by a sustained ocular version in the same gaze direction (not only upwards).

Convergence spasm has been previously reported as the most frequent functional eye movement disorder.² This is driven by a previous small study that found this abnormality in 9 out of 13 patients with FMD.⁸ However, its frequency was far lower in our cohort, only affecting 8.9% patients. This was within the same range of other eye movement abnormalities such as increased latency of saccades (14.9%) and tonic gaze deviation (13.9%) and far lower than excessive blinking (38.6%).

We would like to end by acknowledging several methodological limitations. Most importantly, this is an uncontrolled study. Secondly, we analysed a cohort of patients from a specialist FND clinic, and therefore our patients are probably more severely affected than patients with FND seen in other clinical settings. The majority of our cohort had some form of FMD (92.1%). This limits the generalizability of our findings to people with other manifestations of FND. The clinical phenomena that we reported were rated during normal clinical examination and were not rated off-line by independent raters. This may have

produced a bias which in a future study could be improved by using a more standardized rating system. Finally, our findings on clinical observation warrant further characterization with formal quantitative oculomotor assessment.

In conclusion, we found functional eye and cranial movement disorders to be frequent in cohort of patients with FND. Formal eye movement examination triggered a specific array of objective abnormalities and associated symptoms, which were not associated with reported symptoms prior to examination and which were absent in most patients during casual observation.

Declaration of interest

There are no conflicts of interest.

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References

1. Kaski D, Bronstein AM. Functional eye movement disorders. *Handb Clin Neurol*. 2016;139:343–351. doi:10.1016/B978-0-12-801772-2.00030-8.
2. Kaski D, Bronstein AM, Edwards MJ, Stone J. Cranial functional (psychogenic) movement disorders. *Lancet Neurol*. 2015;14(12):1196–1205. doi:10.1016/S1474-4422(15)00226-4.
3. Kaski D, Pradhan V, Bronstein AM. Clinical features of functional (psychogenic) eye movement disorders. *J Neurol Neurosurg Psychiatry*. 2016;87(12):1389–1392. doi:10.1136/jnnp-2016-313608.
4. Baizabal-Carvallo JF, Jankovic J. Psychogenic ophthalmologic movement disorders. *J Neuropsychiatry Clin Neurosci*. 2016;28(3):195–198. doi:10.1176/appi.neuropsych.15050104.
5. Gupta A, Lang AE. Psychogenic movement disorders. *Curr Opin Neurol*. 2009;22(4):430–436. doi:10.1097/WCO.0b013e32832dc169.
6. Shenhav A, Musslick S, Lieder F, Kool W, Griffiths TL, Cohen JD, Botvinick MM. Toward a rational and mechanistic account of mental effort. *Annu Rev Neurosci*. 2017;40:99–124. doi:10.1146/annurev-neuro-072116-031526.
7. Laub HN, Dwivedi AK, Revilla FJ, Duker AP, Pecina-Jacob C, Espay AJ. Diagnostic performance of the “Huffing and Puffing” sign in psychogenic (functional) movement disorders. *Mov Disord Clin Pract*. 2015;2(1):29–32. doi:10.1002/mdc3.12102.
8. Fekete R, Baizabal-Carvallo JF, Ha AD, Davidson A, Jankovic J. Convergence spasm in conversion disorders: prevalence in psychogenic and other movement disorders compared with controls. *J Neurol Neurosurg Psychiatry*. 2012;83(2):202–204. doi:10.1136/jnnp-2011-300733.