



Original Article

Increased Pediatric Functional Neurological Symptom Disorders After the Boston Marathon Bombings: A Case Series



Réjean M. Guerriero DO^a, Danielle B. Pier MD^a, Claudio M. de Gusmão MD^a,
Miya E. Bernson-Leung MD^a, Kiran P. Maski MD^a, David K. Urion MD^a,
Jeff L. Waugh MD, PhD^{a,b,*}

^a Department of Neurology, Boston Children's Hospital, Boston, Massachusetts

^b Pediatric Movement Disorders Clinic, Massachusetts General Hospital, Boston Massachusetts

ABSTRACT

BACKGROUND: Functional neurological symptom disorders are frequently the basis for acute neurological consultation. In children, they are often precipitated by high-frequency everyday stressors. The extent to which a severe traumatic experience may also precipitate functional neurological abnormalities is unknown. **METHODS:** For the 2-week period after the Boston Marathon bombings, we prospectively collected data on patients whose presentation suggested a functional neurological symptom disorder. We assessed clinical and demographic variables, duration of symptoms, extent of educational impact, and degree of connection to the Marathon bombing. We contacted all patients at 6 months after presentation to determine the outcome and accuracy of the diagnosis. **RESULTS:** In a parallel study, we reported a baseline of 2.6 functional neurological presentations per week in our emergency room. In the week after the Marathon bombings, this frequency tripled. Ninety-one percent of presentations were delayed by 1 week, with onset around the first school day after a city-wide lockdown. Seventy-three percent had a history of a prior psychiatric diagnosis. At the 6 months follow-up, no functional neurological symptom disorder diagnoses were overturned and no new organic diagnosis was made. **CONCLUSIONS:** Pediatric functional neurological symptom disorder may be precipitated by both casual and high-intensity stressors. The 3.4-fold increase in incidence after the Boston Marathon bombings and city-wide lockdown demonstrates the marked effect that a community-wide tragedy can have on the mental health of children. Care providers must be aware of functional neurological symptom disorders after stressful community events in vulnerable patient populations, particularly those with prior psychiatric diagnoses.

Keywords: functional neurological disorder, somatoform disorder, conversion disorder, terrorism

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Introduction

Functional neurological symptom disorder (also known as somatoform or conversion disorder) is a common diagnosis in primary care,¹ neurology clinics,² and in the inpatient setting.³ Often these diagnoses are precipitated by relatively common stressors, such as academic pressure or

family strain,^{4,5} although elicitable triggers may not be identified and are no longer required in current diagnostic criteria.⁶ Nevertheless, intense and ubiquitously felt stressors, such as acts of terrorism, can also increase the frequency of functional neurological symptom disorder and other somatic complaints.^{7,8} These features can last for years, with marked disability and increased health care utilization.⁹ Early recognition and treatment of functional neurological symptom disorder in children lead to resolution or substantial improvement in 80–90%.^{4,10} Therefore, it is crucial to recognize and treat these patients early in the course of their illness.

On April 15, 2013, two bombs were detonated at the finish line of the Boston Marathon, killing three people and

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* Communications should be addressed to: Dr. Waugh; Department of Neurology; Boston Children's Hospital; 300 Longwood Avenue; Fegan 11; Boston, Massachusetts 02115.

E-mail address: jeff.waugh@childrens.harvard.edu

injuring 264.¹¹ While media coverage of the bombings was extensive, in the immediate aftermath, most children saw little disruption in their daily lives—school and work schedules returned to normal on April 16. However, 4 days after the attacks, officials requested a lockdown of Boston and surrounding cities to facilitate the search for the remaining suspect. Businesses and schools closed, families were instructed to stay inside with doors and windows locked, and armored vehicles patrolled the streets. During this 24-hour period, media coverage was difficult to avoid.

In a recent quality improvement project, we studied patients who presented to our pediatric emergency room with functional neurological disorders.¹² These prior patients (presenting 6–36 months before the bombings) allowed us to determine the frequency, characteristics, and outcomes of functional neurological abnormalities in our pediatric population. The Boston Marathon bombings allowed us to determine the impact of a shared high-intensity stressor on our pediatric population and to study whether high-intensity and casual stressors have distinct impacts on functional neurological symptom disorders in children.

Methods

We adapted the protocol of our previous study¹² with the addition of measures to assess the specific impact of the Marathon bombings. Our Institutional Review Board approved this protocol as a quality improvement project and did not require patient consent for chart review or follow-up contact.

Beginning on the day of the Boston Marathon bombings (April 15, 2013), we prospectively identified patients whose differential diagnosis included a functional neurological symptom disorder. We excluded patients with primarily somatic complaints and pain (e.g., headaches) because these diagnoses are difficult to separate from organic disorders in the emergency room setting. Pediatric neurology residents (post-graduate year 3–5) performed a full clinical history and examination on each patient. Data collected included age, gender, nature of abnormalities, date of onset, pre-existing medical and psychiatric diagnoses, and evident stressors (physical and/or sexual abuse, academic difficulties, bullying, extrafamilial relationships, family stressors, contact with the bombing, and school closure).

Follow-up information was gathered by combined chart review and phone interview. All subjects agreed to participate. The diagnosis of

functional neurological symptom disorder was confirmed by attending neurologists after admission (five patients), outpatient follow-up with a senior neurologist or psychiatrist (five patients), or by an attending ophthalmologist (one patient). Follow-up by chart review and telephone calls occurred 4–6 months after presentation, with the exception of two patients who were reached 10 months after presentation. Three authors (D.B.P., M.E.B-L., and R.M.G.) conducted follow-up calls with parents in all cases but one, in which case information was gathered from the 19-year-old patient directly. Follow-up data were collected through structured telephonic interview as described elsewhere¹² with the additional inquiry into (1) whether the patient's school was closed during the lockdown and (2) whether the parent felt the bombings or lockdown was a stressor for their child.

Daily incidence was calculated for functional neurological symptom onset and for emergency room presentation—both measures produced similar results. We compared baseline and post-event incidence of functional neurological symptom disorders using a zero-inflated Poisson regression model. The high number of zero values (no patients on a given day) required this variation on the more-common Poisson regression. This model allowed us to estimate the incidence of functional neurological disorder on any given day for periods before and after the city-wide lockdown on Friday, April 19.

Results

For the 2 weeks after the Boston Marathon bombings (Tuesday, April 16, to Tuesday, April 30), 11 patients presented to our pediatric emergency room with findings suggestive of functional neurological symptom disorder (Table). Symptom onset for the majority (eight of 11 patients) was delayed to the second week after the bombings (Figure). We found a 3.4-fold increase from the baseline frequency of presentations in our emergency room¹² (baseline incidence, 0.46; 95% confidence intervals, 0.11–0.82; post-bombings incidence, 1.6; 95% confidence intervals, 0.31–2.9; $P = 0.048$).

Attending neurologists and/or psychiatrists confirmed that functional neurological symptom disorder was the sole explanatory diagnosis in 10 of 11 patients. The final patient (one of 11) had functional abnormalities superimposed on a possible medication side effect. The diagnostic accuracy of this initial suspicion (91%) is comparable with that previously demonstrated in childhood functional neurological symptom disorder.¹²

TABLE.
Demographic Information for Patients Diagnosed With a Functional Neurological Disorder

Age, yr	Gender	Presentation	Psychiatric Comorbidity	Neurological Comorbidity	Stressors	Symptom Duration (days)
7	F	Sensory	Somatoform	No	None	30
10	F	Weakness/gait	No	BRE	None	1
10	F	Sensory	No	No	Academic, bullying, bombing	Intermittent
12	M	Weakness/gait	Anxiety	No	None	14
12	M	Mixed	Anxiety, depression	No	Academic, family	60
12	F	Weakness/gait	Anxiety	Neuroinflammatory	Academic, family	>150
15	M	Sensory	Anxiety	Abdominal migraines	Academic, bombing	10
15	F	Motor/sensory	Psychosis	Epilepsy	Bullying	7
15	F	Mixed	Anxiety	No	Nonspecific	42
17	F	Mixed	Anxiety	Yes	Academic	60
19	F	Sensory	No	Pseudotumor cerebri	None	14

Abbreviations:

BRE = Benign rolandic epilepsy

F = Female

M = Male

Stressors and symptom duration were assessed by parental recall at follow-up.

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