Journal of the Neurological Sciences 359 (2015) 193–196

Contents lists available at ScienceDirect

Journal of the Neurological Sciences

journal homepage: www.elsevier.com/locate/jns

Clinical short communication

Gastrointestinal dysfunction in postural tachycardia syndrome

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ARTICLE INFO

Article history:
Received 16 August 2015
Received in revised form 18 September 2015
Accepted 14 October 2015
Available online 30 October 2015

Keywords:
POTS
Postural tachycardia
Dysmotility
Gastroparesis
Dysautonomia
Gastrointestinal symptoms
Constipation
Gastric emptying

ABSTRACT

Background: Postural tachycardia syndrome (POTS) is a dysautonomia defined by an exaggerated increase in heart rate upon changing posture. It is associated with disturbances involving multiple organ systems, including neurologic, dermatologic, and gastrointestinal (GI) symptoms. Previous studies identified GI complaints in these patients and showed gastric emptying and electrical activity abnormalities. However, the full spectrum of GI symptoms and their impact on quality of life remains unclear.
Methods: A 30-question survey of GI symptoms was collected from 28 patients with POTS seen in the Boston Medical Center Autonomic Clinic. Answers were recorded on a Likert rating scale. Symptoms were positive if patients answered "strongly agree" or "agree" and negative if they answered "strongly disagree" or "disagree." Responses were collected and analyzed.
Results: The most commonly reported GI symptoms were nausea (86%), irregular bowel movements (71%), abdominal pain (70%), and constipation (70%). Additionally, 82% of patients reported having GI symptoms more than once per week, and 71% reported having seen a GI specialist, and symptoms did not improve with changes in position. Twelve patients had undergone a gastric emptying study, and six of these patients reported receiving a diagnosis of gastroparesis or delayed gastric emptying.
Conclusions: GI disturbances are common, frequent, and prolonged in patients with POTS, likely impacting quality of life. Given the importance of the enteric nervous system to normal GI functioning, the same autonomic impairment leading to POTS may result in abnormal gut motility and ultimately subjective GI discomfort.

1. Introduction

Postural tachycardia syndrome (POTS) is a dysautonomia predominantly seen in young women and children. In adults, it is diagnosed by an increase in pulse of at least 30 beats per minute (bpm) or a maximum pulse of at least 120 bpm within 10 min of standing or 70° tilt in the absence of orthostatic hypotension and any precipitating factors (i.e. prolonged bed rest, medications, or other disorders causing tachycardia) [1]. Proposed mechanisms include neuropathic and hyperadrenergic dysregulation, as well as volume depletion and deconditioning, but the pathophysiology of POTS remains uncertain [2–4]. In addition to typical symptoms such as lightheadedness, weakness, and blurred vision, patients have a variety of complaints in diverse organ systems. Gastrointestinal complaints are common, in particular nausea, bloating, and abnormal bowel movements. Studies have shown abnormal gastric electrical activity during postural change in POTS patients. Gastroparesis and irritable bowel syndrome have also been reported [5]. Underlying dysautonomia involving the enteric nervous system may account for gastric arrhythmia and dysmotility, but this may be a simplified explanation of the pathophysiologic mechanisms [6]. Regardless of the pathophysiology, the breadth of the gastrointestinal symptoms in this population has not been fully described in the current literature. Therefore, we conducted a detailed survey of the gastrointestinal complaints in a cohort of POTS patients in an effort to better understand the range of symptoms.

2. Methods

With the approval of The Boston University Medical Campus/Boston Medical Center Institutional Review Board, we designed and distributed a 30-question survey encompassing core gastrointestinal symptoms, associated symptoms, and relevant medical history. Verbal consent was obtained from subjects prior to administering the surveys. Responses were elicited on a five-point Likert scale. Surveys were completed from 2013 to 2015 by 28 patients meeting diagnostic criteria for POTS in the Boston Medical Center Autonomic Clinic. Responses were converted to integers (strongly disagree = 1, disagree = 2, neutral = 3, agree = 4, strongly agree = 5). Frequency of positive responses (strongly agree and agree) and median and interquartile ranges were calculated and graphed using Microsoft Excel and StatPlus.

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http://dx.doi.org/10.1016/j.jns.2015.10.052
0022-510X/

Table 1
Baseline characteristics (n = 26)*.

Age, mean ± SD (years)	30 ± 11
Females	24 (92%)
Body mass index, mean ± SD (kg/m^2), n = 16	25 ± 8
Age at symptom onset (years), n = 22	
<18	11 (50%)
18–25	4 (18%)
>25	7 (32%)
Time to diagnosis (years), n = 13	
<1	5 (38%)
1–10	7 (54%)
>10	1 (8%)
Highest education level, n = 21	
High school	9 (43%)
Associate degree	1 (5%)
Undergraduate degree	9 (43%)
Graduate degree	2 (9%)

* n = 26 unless otherwise stated (no demographic data available for two patients).

3. Results

Baseline characteristics of 26 of the 28 patients are listed in Table 1 (no demographic data were available for two patients). The most commonly reported core gastrointestinal symptoms were nausea (86%), irregular bowels (71%), abdominal pain (70%), constipation (70%), heartburn (64%), cramps (61%), and bloating (59%, Fig. 1). The strongest consensus was for nausea (med = 4, IQR = 1), cramps (med = 4, IQR = 1), and bloating (med = 4, IQR = 1.75). There was weaker consensus for abdominal pain (med = 4, IQR = 2), irregular bowels (med = 4, IQR = 2), constipation (med = 4, IQR = 2.5), and heartburn (med = 4, IQR = 3) (Fig. 1). Twenty-seven patients (96%) reported at least one core GI symptom, and 25 patients (89%) reported three or more symptoms. Mean number of core symptoms reported was 6.6 out of 12 with a standard deviation of 3.2.

For associated factors, there was a very strong consensus that GI symptoms occur more than once per week (med = 5, IQR = 1) and do not improve with supine position (med = 4, IQR = 1.25, Fig. 2). There was weaker consensus that symptoms last for more than a few hours (med = 4, IQR = 2), worsen with exercise (med = 4, IQR = 2) and worsen with food or drink intake (med = 4, IQR = 2.5, Fig. 2). For medical history, 63% of patients reported having seen a gastroenterologist. Twelve patients (43%) reported having undergone a gastric emptying study, of which 6 patients reported receiving a diagnosis of gastroparesis or delayed gastric emptying. Some patients endorsed a diagnosis of irritable bowel syndrome (32%) and inflammatory bowel disease (7%) (Fig. 3).

4. Discussion

Gastrointestinal discomfort is commonly associated with POTS. Prior studies surveying GI symptoms in POTS found high frequencies of nausea (39–82%) and bloating (24–55%) but lower frequencies of diarrhea and vomiting [6–7]. While we found similarly high rates of nausea and bloating and low rates of diarrhea and vomiting, other symptoms such as abdominal pain, constipation, and heartburn occurred at much higher frequencies compared to prior studies. In addition, nearly all patients reported at least one GI symptom in the past month, and the average number of symptoms was over six. It is unclear why our cohort experienced GI symptoms at such seemingly high frequencies, but the fact that nearly half of the core symptoms were not common (frequency <50%) argues against over-reporting.

To understand the scope of these symptoms and their potential to affect quality of life, we investigated associated symptoms by directly surveying patients, which has not been previously attempted. In our cohort, symptoms were frequent (occurring more than once per week) and prolonged (lasting for more than a few hours). They were also exacerbated by daily activities (exercise, food/drink intake) and not clearly related to known exacerbating factors such as upright positioning. Given these attributes, it is reasonable to assert these symptoms could negatively impact daily functioning. Further studies using validated scales of quality of life would be useful to confirm this assertion.

POTS GI symptoms may be related to dysfunction of the enteric nervous system resulting in gastric arrhythmias and dysmotility as motility disorders have been frequently associated with autonomic dysfunction

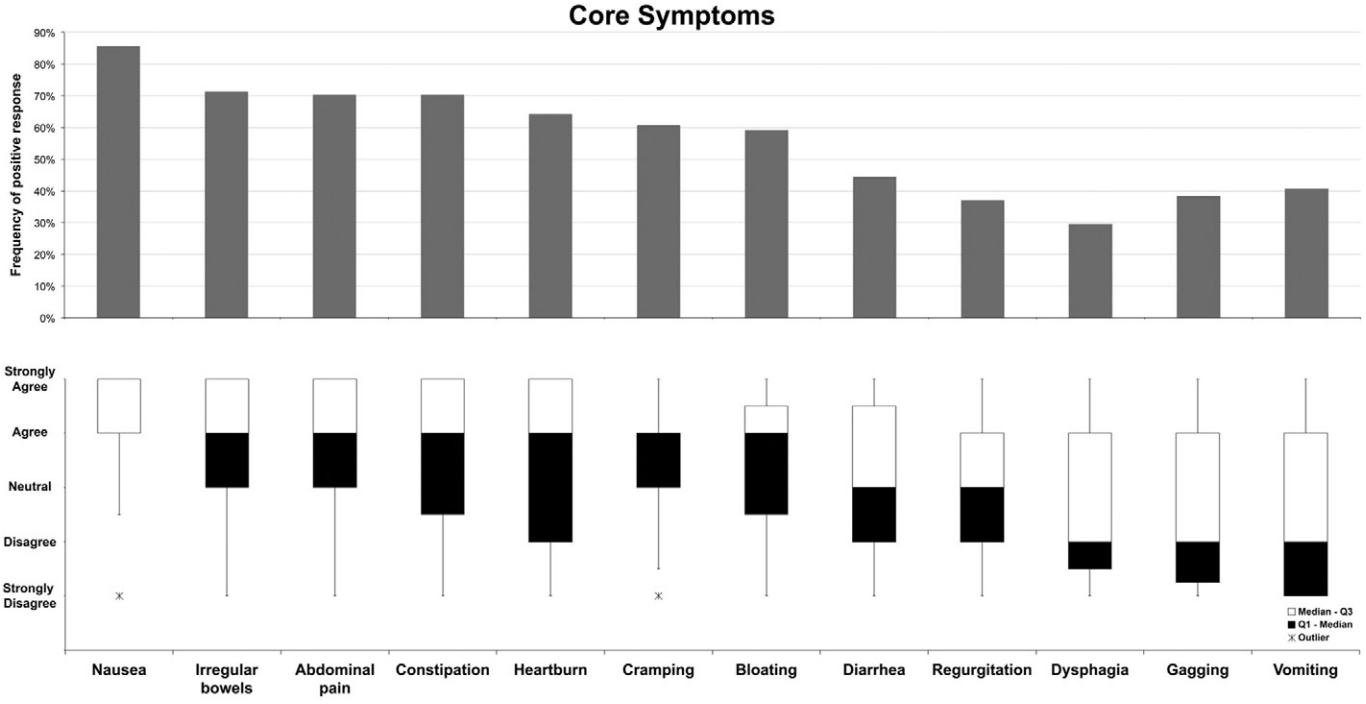

Fig. 1. Response rates for the twelve core GI symptoms. Top: bar graph displaying frequency of positive responses ("strongly agree" or "agree"). Bottom: box-and-whisker plots displaying mean and interquartile range for each symptoms. Q1 = first quartile, Q3 = third quartile.