Autonomic nervous system dysregulation in irritable bowel syndrome

Thesis

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List of Abbreviations

5HT-3	5-hydroxytryptamine-3 receptor
5-HT4	5-hydroxytryptamine-4
ACG	American College of Gastroenterology
ANS	Autonomic nervous system
B.P	Blood pressure
BGA	Brain gut axis
BMI	Body mass index
BMR	Basal metabolic rate
CBC	Complete blood count
CNS	Central nervous system
CRF	corticotropin releasing factor
CRP	C-reactive protein
CVD	Cardiovascular disease
ECG	Electro-cardio-gram
ESR	Erythrocyte sedimentation rate
FODMAPs	Fermentable oligo- di-and monosaccharides and polyols
GABA	gamma amino butyric acid
GC-C	Guanylate cyclase C
GIT	Gastro-intestinal tract
H.R	Heart rate
HGB	Hemoglobin
HPA	Hypothalamus-pituitary-adrenal
HRR	Heart rate recovery
HRV	Heart rate variability
hsCRP	High sensitivity CRP
IBD	Irritable bowel diseases
IBS	Irritable bowel syndrome
IBS-C	Irritable bowel syndrome with constipation
IBS-D	Irritable bowel syndrome with Diarrhea
IBS-M	Mixed IBS
IgA	Immunoglobuline A
IgG	Immunoglobuline G

L	lumbar
NMDA	N-methyl-D-aspartate
PANS	parasympathetic autonomic nervous system
PEG	polyethylene glycol
PI	post-infectious
PNS	parasympathetc nervous system
RAAS	Renin-angiotensin-aldosterone system
RMSSD	Root mean square successive difference
RR	R waves
SA	Sino-atrial
SANS	sympathetic autonomic nervous system
SDANN	Standard deviation of sequential 5-min RR interval means
SDNN	Standard deviation of the normal to normal interval
SIBO	Small intestinal bacterial overgrowth
SNS	Sympathetc nervous system
SSRIs	serotonin reuptake inhibitors
T	Thoracic
TCAs	Tricyclic antidepressants

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Abstract

Objectives: The aim of the current study was designed to evaluate autonomic regulation in IBS subjects and healthy controls by means of a non-invasive approach.

Methods: this study was designed to be a cross section study. The patients enrolled in the present study were those with proven irritable bowel syndrome recruited from ***Ain Shams University Hospitals.***

All the studied cases were subjected to the following: full medical history, thorough clinical examination, routine laboratory investigations and Holter ECG.

Results: The results of the present study are no significant difference between IBS patients and control could be elicited as regard Holter data.

Conclusion : The previous data and results recorded showed that there is some autonomic nervous system dysregulation in irritable bowel syndrome as regards to **heart rate,** which represent higher sympathetic activity in IBS patients. Also, the orthostatic changes of arterial blood pressure in IBS patients from supine to erect position more than that occur in controls patients.

Keywords: Irritable bowel syndrome (IBS), Autonomic nervous system (ANS).

Introduction

Irritable bowel syndrome (IBS) is a very common gastrointestinal disorder, estimated to be present in about 11-15% of the global population ***(Lovell, 2012; Mearin, 2012).*** Typical IBS symptoms include chronic abdominal pain, bloating, and varying bouts of diarrhea and constipation. The condition is generally associated with a reduced quality of life ***(Mayer, 2008).*** IBS is a functional disorder, and as such has not been consistently linked to tissue damage or other biological markers that can be tested clinically ***(Mayer, 2008; Torpy, 2011).***

Multiple factors may cause or exacerbate IBS symptoms. For example, stress, anxiety, depression, food sensitivities, small intestinal bacterial overgrowth, and hormonal fluctuations are all associated with IBS ***(Reddymasu, 2010; Yakoob, 2011).***

The cardinal symptom of IBS is abdominal pain that is relieved with defecation and associated with a change in stool frequency or appearance ***(Di Palma, 2012)***.

Pain or discomfort associated with IBS typically "flares" for 2-4 days intermittently. Other symptoms not directly associated with the GI tract have been reported in some IBS patients, including headache, backache, and lethargy.

People with IBS frequently experience symptoms for years after diagnosis; however, IBS doesn't increase risk for more serious conditions like colon cancer ***(Spiller, 2007).***

Subcategories of IBS include ***constipation-predominant (IBS-C)***and ***diarrhea-predominant (IBS-D)***, with the former associated with fewer than 3 bowel movements per week and the latter associated with more than 3 bowel movements per day ***(Mearin, 2012).***

Diagnosing IBS is complex and often involves multiple tests to rule out several other diseases that may be associated with IBS-like symptoms such as hyperthyroidism, celiac disease, lactose or fructose malabsorption, IBD, microscopic colitis, colon cancer and/or pancreatic cancer ***(Torpy, 2011; Mearin, 2012).*** A complete blood count and bloodchemistry panel may be ordered as well to assess for anemia or other abnormalities ***(Torpy, 2011).***

The Rome III criteria have been developed in order to help facilitate accurate diagnosis of IBS ***(Dang, 2012; Ferri, 2012).*** According to the Rome III criteria, a diagnosis of IBS requires recurrent abdominal pain or discomfort at least 3 days per month during the past 3 months associated with 2 or more of the following :

1. Improvement with defecation.
2. Onset associated with a change in stool frequency.
3. Onset associated with a change in stool appearance.

(Lee, 2012; Ferri, 2012)

The autonomic nervous system (ANS) controls several basic bodily functions. These include heart rate, body temperature, breathing rate, digestion, and many other systems as well. The ANS provides the connection between your brain and your internal organs. For instance, it connects to the heart, liver, sweat glands, and even the interior muscles of your eye (***Christine, 2013).***

The ANS is made up of two subsystems: the sympathetic autonomic nervous system (SANS) and the parasympathetic autonomic nervous system (PANS). Most organs have nerves from both the sympathetic and parasympathetic systems (***Christine, 2013).***

Dysfunction of the autonomic nervous system (ANS) has been hypothesized to be involved in a number of functional diseases including irritable bowel syndrome (IBS), with evidence dating back to the beginning of the twentieth ***(Bockus et al., 1928).***

In clinical studies, RR variability is frequently obtained from ECG Holter recordings (over 24 h), or segments thereof (e.g., night periods, day periods) and there is a significant relationship between time domain indices of variability obtained with long or short-term recordings, particularly in absolute units (***Task Force of the European Society of Cardiology, 1996).***

Aim of the Work

The current study was designed toevaluate:

Autonomic regulation in IBS subjects and healthy controls by means of a non-invasive approach.

Irritable bowel syndrome

Definitions:

Irritable bowel syndrome (IBS) is a chronic functional disorder of the gastrointestinal tract defined as recurrent abdominal pain or discomfort at least three days per month in the last three months with two or more of the following: improvement with defecation, onset associated with a change in frequency of stool, or onset associated with a change in form (appearance) of stool ***(Peery,* Dellon *et al., 2012).***

Subtypes of IBS have been defined as follows:

- **IBS with constipation** – IBS with constipation (IBS-C) is defined as the presence of hard or lumpy stools with ≥25 percent of bowel movements and loose or watery stools with <25 percent of bowel movements.

- **IBS with diarrhea** – IBS with diarrhea (IBS-D) is defined as the presence of loose or watery stools with ≥25 percent of bowel movements and hard or lumpy stools with <25 percent of bowel movements.

- **Mixed IBS** – Mixed IBS (IBS-M) is defined as hard or lumpy stools with ≥25 percent of bowel movements and