Opinion
Volume 7:3, 2022

Journal of Inflammatory Bowel Diseases & Disorders

ISSN: 2476-1958 Open Access

Assessing Subcortical Structure Volumes in Patients with General Digestive Diseases

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Introduction

Both chronic gastrointestinal (GI) disorders that are non-specific inflammatory bowel diseases IBD (ulcerative colitis, UC and Crohn's disease, CD) and functional gastrointestinal disorders (FGIDs) (such as irritable bowel syndrome, IBS and functional dyspepsia, FD) have a significant negative impact on the patient's quality of life. The causes of FD, IBS and IBD are complicated and not fully understood, but they are also thought to be closely linked to psychological variables like stress, depression, anxiety and other similar conditions. Irritable bowel syndrome and functional dyspepsia symptoms are covered in Rome IV, a compilation of diagnostic criteria.

Description

The functional bowel illness known as IBS is chronic and incapacitating. When no obvious structural or biochemical defects are discovered, a functional label is used. While functional dyspepsia is characterized as a relapsing and remitting disorder consisting of a sensation of pain or burning in the epigastrium, early satiety and fullness during or after a meal, IBS is diagnosed based on recurrent abdominal pain related to defecation or along with a change in stool frequency or form. Both Crohn's disease (CD) and ulcerative colitis (UC), which have recurrent flare-ups and remissions, are chronic, non-specific disorders covered by the phrase "inflammatory bowel diseases." The central nervous system (CNS), autonomic nervous system (ANS), enteric nervous system (ENS), hypothalamic-pituitary-adrenal (HPA) axis, neuronal, endocrine and immunological systems work together to maintain a bidirectional communication pathway between the gut and brain. The relationship between biological behavior, emotions and cognitive processes in people with gastrointestinal illnesses is explained by the brain-gut axis hypothesis. Different parts of the brain are involved in the stress response, particularly the amygdala, hippocampus and hypothalamus. According to recent research, the HPA axis and changes in the interactions between bacteria and the mucosa can both be affected by stress in IBD. The neuroendocrine system's main axis, known as the HPA axis, regulates how we respond to stress. Its dysregulation has been linked to mood disorders such as bipolar disorder, anxiety and depression [1].

Corticotropin-releasing factor (CRF), which is secreted by the hypothalamus as a result of the HPA axis activation, stimulates the pituitary gland to release adrenocorticotropic hormone (ACTH), which in turn causes the adrenal cortex to release the immunosuppressive stress hormone cortisol, which results in the production of anti-inflammatory cytokines. Rodent and human crypt investigations demonstrated that stress-induced cortisol enhances intestinal barrier failure. It was also demonstrated that cortisol has a role in controlling intestinal inflammation and modifying the composition of the microbiota. Patients with IBD had lower HPA axis function, according to Mawdsley et al. The prefrontal cortex, anterior insula and posterior insula all showed greater activation in the studies that were conducted. On the impact of IBD and FGIDs on brain anatomy and function, there are, however, surprisingly few clinical neuroimaging investigations. Our objective was to measure the volume of subcortical regions since more research is required to show the precise brain areas that change during these gastrointestinal illnesses [2].

Very little is known about how gastrointestinal disorders affect brain growth. The development of models to study the effects of psychological variables and inflammation, as well as the knowledge of the neurophysiology of gastrointestinal discomfort, are two areas where functional brain imaging has considerable promise. In this study, we discovered that there was a difference in the volume of the thalamus between IBD patients and both the control group and IBS patients and that it happened to be smaller in IBD patients. Agostini et al. noted instances of decreased grey matter volumes in the dorsolateral prefrontal cortex and anterior midcingulate cortex. Additionally, they showed a negative correlation between disease duration and the size of the subgenual anterior cingulate posterior MCC ventral posterior cingulate and Para hippocampal cortices [3].

Our research, however, only found a correlation between the severity of disorders like IBD and IBS and the volume of the thalamus, which is smaller in both of these conditions. The human thalamus is defined as a nuclear complex and a hub for communication between the diencephalons subcortical brain areas and the cerebral cortex. It assists the motor and sensory systems. Davis and Nair both found lower thalamic volumes in IBS or IBD patients compared to controls, which is similar to our findings. The thalamus is frequently linked to the malfunctioning of the brain-gut relationship, which is significant in the context of our work [4].

For assessing or predicting the efficacy of therapy therapies intended to address coexisting emotional and cognitive issues, structural and functional modifications are considered as objectives. In light of the fact that patients frequently exhibit elevated levels of anxiety, depressive symptoms and emotional distress, many experts endorse the hypothesis that stress and other psychological problems contribute to the onset of gastrointestinal ailments. Future studies should consider factors including cognitive and emotional functioning as well as depressive symptoms, in our opinion. Patients will be able to receive a more comprehensive level of care as a result, improving their quality of life in terms of both physical and mental health [5].

Conclusion

This study showed a correlation between the behavior of gastrointestinal conditions like IBD and IBS and the thalamus's size, which is smaller in both conditions. The failure of brain-gut communication is frequently linked to the thalamus. For assessing or predicting the efficacy of therapy therapies intended to address coexisting emotional and cognitive issues, structural as well as functional alterations are considered as targets.

Conflict of Interest

None.

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Date of submission: 02 May, 2022, Manuscript No. jibdd-22-75071; **Editor assigned:** 09 May, 2022, PreQC No. P-75071; **Reviewed:** 16 May, 2022, QC No. Q-75071; **Revised:** 23 May, 2022, Manuscript No. R-75071; **Published:** 30 May, 2022, DOI: 10.37421/2476-1958.2022.7.162

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How to cite this article: Blum, Jonas. "Assessing Subcortical Structure Volumes in Patients with General Digestive Diseases." J Inflam Bowel Dis Disorder 7 (2022): 162.