



Central Nervous System Modulation—Its Role in Irritable Bowel Syndrome

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The nervous system controls what we feel and what we do. It consists of the *central nervous system* or CNS (brain and spinal cord) and the *peripheral nervous system*, which connects the rest of the body with the CNS. The peripheral nervous system is subdivided into specialized systems, one of which is the autonomic nervous system.

The *autonomic nervous system* regulates the activities of the visceral organs, which include the gut. These activities are usually automatic and not consciously controlled.

The *enteric nervous system* is a division of the autonomic nervous system. This system is found in the tissue that lines the digestive organs. It interacts closely with the CNS and can perform many independent functions.

Most of us have experienced some of the ways that the central nervous system (CNS) affects the gut in our everyday lives. The effect may be direct, like an urgent need to evacuate the bowels when life gets exciting. It may be indirect, like the decision to suppress the urge to go to the bathroom when social circumstances, work, or sanitary conditions do not allow it.

In this article, we will examine four methods of brain-gut interaction and their influence on irritable bowel syndrome (IBS). These include:

- Stress and emotions
- Behaviors
- CNS diseases and drugs
- CNS therapy/psychotherapy

Stress and Emotions

Diarrhea may occur at inappropriate times—during a test, a professional presentation, or another important social or personal event. This happens to most of us on occasion. It demonstrates that during such stressful situations the CNS exhibits direct control, through hormones and neural transmitters, over the colon. It

influences motility and propulsion, thereby accelerating the movement of food and liquid through the colon.

This will result in diarrhea and may be accompanied by abdominal pain. Once the stressful situation disappears, the colon usually returns to normal action.

Other emotions exhibit direct influence on the gut, particularly “negative” feelings. People with anxiety and panic disorders frequently report IBS-like symptoms, while slowed transit and constipation often accompany depression.

The same stress factors in another person may act on the stomach rather than on the intestines. This results in slowed, rather than accelerated, colonic transport and emptying. The symptoms that occur are more like dyspepsia. These include upper abdominal discomfort and pain, bloating after a meal, belching, regurgitation, and heartburn. Symptoms disappear once the stomach is empty and the cause of the stress diminishes.

In general, people with IBS respond to stress in much the same way as people without IBS symptoms. They may have a more rapid or heightened response than people with no IBS symptoms. This is called *hypersensitivity* and is currently the most frequently discussed and investigated theory for why people get IBS.

Behaviors

The effects of stress on the gastrointestinal system are examples of *direct* CNS influence of gut functions. Behaviors, such as those related to food intake or defecation, are examples of *indirect* CNS control. The speed at which food is ingested, the amount, its composition, and the social circumstance in which

eating occurs are all behaviors that have an effect on the processing of food in the gut.

A fatty meal, for instance, is processed more slowly through the stomach, and emptying time is prolonged. This can result in dyspepsia and may generate symptoms of abdominal cramps and diarrhea. Many people are aware of their own food intolerances or aversions. They experience symptoms after a meal when they are not careful to avoid or reduce consumption of offending food.

An example of food intolerance is lactose malabsorption—the inability to digest milk sugar properly. Symptom occurrence (diarrhea, bloating, and abdominal pain) after consuming lactose-containing food is very likely. Once people are aware that they have lactose intolerance they can avoid symptom onset by avoiding lactose-containing food.

Defecation is another example of a behavior that may affect GI tract function. Several studies of healthy subjects have confirmed that voluntary delay of defecation for up to one week results in delayed bowel transit. It can also result in symptoms associated with constipation-predominant IBS (e.g., abdominal discomfort and pain, painful defecation with excessive straining, upper abdominal discomfort, delayed gastric emptying, loss of appetite). Voluntary or socially induced delay of defecation for reasons such as; lack of time, working conditions, or sanitary conditions, is often brought up by patients with IBS and constipation when they explore and explain their illness history.

CNS Diseases and Drugs

Neurologic diseases that are known to cause GI symptoms illustrate how the CNS can affect the GI tract. For example, patients with Parkinson's disease are known to suffer from constipation. Patients with Multiple Sclerosis frequently have either bladder or anal incontinence or both; others have constipation of true “spastic pelvic floor” nature (where the internal anal sphincter and puborectalis muscle fail to relax as required for defecation). Patients with damage to the CNS frequently report diarrhea, dyspepsia and other GI symptoms.

These examples show that, in general, if CNS control is missing or generates the wrong signals to the gut, this

will result in disturbed function. [Note: These conditions are not implied in IBS patients, since the presence of a severe neurological disease would usually be excluded by the diagnosis of IBS.]

Other CNS disorders may be regarded as temporary or psychological, such as those related to a trauma (post-traumatic stress disorder), depression, panic disorder, or eating disorder, and they may occur in a person with IBS symptoms. In these cases it is well established that some of the IBS symptoms are generated by the CNS disorder itself and are not a separate disease (e.g., when the depression vanishes, the bowel symptoms may be gone as well). As a consequence of the relationship between the central nervous system and the gut, psychotherapy is effective in treating IBS in some people.

Unfortunately, many psychotropic drugs, which act on the CNS to treat the psychological state, can have intestinal side effects that can make IBS symptoms worse. For example, tricyclic antidepressants can have a constipating effect. Many pain medications, especially opioid-like products, may do the same. Other medications that act on the peripheral nervous system—such as those taken to regulate blood pressure—can have unwanted side effects on the gut.

Tell your physician about any medications you are taking, even those unrelated to treatment for GI symptoms. If it appears that a necessary drug is causing unwanted side effects, a change in the prescription may be appropriate. Consult your physician if you have any concerns about medication you are taking. Do not stop taking medication on your own.

CNS Therapy/Psychotherapy

Recent IBS research shows that if a psychological disorder such as stress disorder, anxiety, or depression is present, treatment of that disorder may relieve IBS symptoms as well. In most cases, psychotherapy is used in conjunction with conventional medical treatment, and this combination therapy seems to provide more effective relief than medical treatment alone. This has led many clinicians to offer such treatment in medical hospitals. It does not imply that symptoms are viewed as “all in the head.”

Current concepts of psychotherapy in IBS recognize that chronic functional GI symptoms are very real, representing a complex interaction between the mind and the body. Therapy consists of a series of around 10 sessions, in which the patient is given explanations about gut functions, information about the nature of IBS, and techniques to help manage symptoms when they occur. Other techniques are offered to help deal with external factors and life conditions that seem to provoke or worsen symptoms. In combination therapy, medical treatment for gut symptoms is provided at the same time.

Effective symptom relief has been reported with stress management training, relaxation therapy, cognitive-behavioral modification, and hypnosis. Experimental tests have shown that hypnosis may be effective in altering the hypersensitivity of the gut, probably the best example of central nervous system modulation of gut functions and its role in IBS.

Summary

In summary, CNS modulation of gut functions can occur directly as the body's response to stress or indirectly as the consequence of individual behaviors. In all cases, the response itself is not the disease since it is also present in healthy subjects. IBS patients, however, seem to show a somewhat increased response to such stimuli, be it heightened motility of the gut or heightened sensitivity to normal events.

The central nervous system has shown to be a major factor in symptom occurrence, awareness, and severity. It may be targeted for symptomatic treatment with behavioral modification or other treatment methods. In some cases, central-acting drugs may be prescribed. Possible behavioral strategies range from keeping a diary of foods or events that seem to trigger symptoms, to seeking counseling or therapy.

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