REVIEW ARTICLE

Etiology, Evaluation, & Osteopathic Management of Adult Constipation

Jessica Watari, BS, OMS IV,[1] Melinda Danowitz, BA, OMS IV,[1]
Samuel Jacob, BS, OMS IV,[1] & To Shan Li, DO[2]

[1] New York Institute of Technology College of Osteopathic Medicine - Old Westbury, NY
[2] Assistant Professor, Department of Osteopathic Manipulative Medicine
New York Institute of Technology College of Osteopathic Medicine - Old Westbury, NY

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Constipation in adults is a common complaint seen in family practice that can broadly be defined as infrequent stools and/or difficult stool passage. Constipation can be classified as primary (functional) constipation or secondary constipation. Primary constipation can further be differentiated as normal transit, slow transit, or outlet obstruction. Secondary constipation may be due to medications, mechanical issues, metabolic disturbances, neurological causes, or myopathies. The autonomic nervous system segmentally innervates the gastrointestinal tract and plays an important role in colonic muscle tone, contractility, and mucous secretion. Intestinal motility is one of multiple factors that can influence the intestinal microflora, which research has shown to be altered in those with constipation. Evaluation of constipation involves gathering a thorough history regarding the patient's definition of constipation, medication use, and any symptoms indicative of organic disease. Physical examination should include examination of the abdomen, perineum, and rectum. Osteopathic structural examination should focus on assessing regions of sympathetic and parasympathetic influence as well as identifying any sacral or pelvic restrictions. If the history and physical exam reveals any symptoms or signs of organic disease, further work-up is warranted. Initial therapy for patients with primary constipation is lifestyle modifications such as exercise, high fiber diet, and increasing water intake. If this is not effective, pharmacological agents can be used such as osmotic laxatives and bulking agents. Additionally, osteopathic manipulative treatment (OMT) techniques, such as rib raising, suboccipital release, sacral rocking, abdominal lifts, and abdominal and pelvic diaphragm release may improve symptoms and disease severity.

DEFINITION OF CONSTIPATION

Functional constipation can be defined using the most recent Rome III criteria. The criteria must be fulfilled for the last 3 months with symptom onset at least 6 months prior to diagnosis *(Table 1)*. In order to be diagnosed with functional constipation, a patient cannot meet the criteria for irritable bowel syndrome (IBS) *(Table 2)*. Although the Rome criteria provide a standardized diagnostic criteria, it is argued that it cannot feasibly be used in practice as most patients with constipation do not meet the criteria. The American College of Gastroenterology Chronic Constipation Task Force recommends using the following broader definition of chronic constipation: "unsatisfactory defecation characterized by infrequent stools, difficult stool passage or both."[2] Difficult stool passage includes straining, a sense of difficulty passing stool, incomplete evacuation, hard/lumpy stools, prolonged time to stool, or need for manual maneuvers to pass stool. In order to be defined as chronic, symptoms must be present for at least three of the previous 12 months.

ETIOLOGY

There are both primary and secondary causes of constipation. Primary, or functional, constipation can be classified as normal transit, slow transit constipation, or obstructive defecation. Normal transit constipation is the most common form and may be due to perceived difficulty with passing hard stools. It will typically respond to increased dietary fiber or an osmotic laxative. Slow transit constipation results from decreased or uncoordinated motor activity in the colon leading to hard, small feces.[6] Obstructive defecation may be due to insufficient rectal forces or inadequate anal relaxation. Obstructive defecation can also be attributed to paradoxical contraction of the puborectalis and external anal sphincter during defecation.[6,7] Patients with defecatory disorder will typically present with prolonged straining, difficulty passing soft stools, and rectal discomfort.

Secondary causes for constipation are numerous and deserve the necessary work-up if clinically warranted. Secondary constipation may be due to medications, myopathies, mechanical, metabolic, neurological, and psychological causes *(Table 3)*.[8,9,10]

CORRESPONDENCE:
To Shan Li, DO | tli05@nyit.edu

TABLE 1:

Rome III Criteria for Functional Constipation[1]

Must include 2 or more of the following:

- Straining during at least 25% of defecations
- Lumpy or hard stools in at least 25% of defecations
- Sensation of incomplete evacuation for at least 25% of defecations
- Sensation of anorectal obstruction/blockage for at least 25% of defecations
- Manual maneuvers to facilitate at least 25% of defecations (e.g. digital evacuation, support of the pelvic floor)
- Fewer than 3 defecations per week

Loose stools are rarely present without the use of laxatives

There are insufficient criteria for IBS

TABLE 2:

Rome III Criteria for Irritable Bowel Syndrome (IBS)[1]

Recurrent abdominal pain or discomfort at least 3 days per month in the last 3 months associated with 2 or more of the following:

- Improvement with defecation
- Onset associated with a change in frequency of stool
- Onset associated with a change in form (appearance) of stool

TABLE 3:

Secondary Causes of Constipation [8,9,10]

Medications	Mechanical	Metabolic	Neurological	Myopathies	Psychological
• Anticholinergics • Diuretics • Beta blockers • Opioids • Antacids, especially with calcium • Iron supplements • Calcium channel blockers • Antidepressants • Acetaminophen • Aspirin • NSAIDs	• Anal fissures • Colon cancer • Stricture • Rectocele • Sigmoidocele • Enterocele • Rectal prolapse • Megacolon	• Electrolyte disturbances *(hypercalcemia, hypokalemia, hypomagnesemia)* • Diabetes mellitus • Hyperparathyroidism • Hypothyroidism • Chronic renal failure	• Dementia • Parkinson Disease • Multiple Sclerosis • Cerebrovascular Disease • Spinal cord injury • Cauda Equina Syndrome	• Scleroderma • Amyloidosis	• Depression • Personality Disorders • History of abuse

ANATOMICAL CONSIDERATIONS OF THE GASTROINTESTINAL TRACT

The adult distal gastrointestinal tract has a variable length, typically averaging around 150 cm.[11,12,13] It extends from the ileocecal valve to the anus and consists of the cecum, ascending, transverse, descending, sigmoid colon, rectum, and anus. The blood supply and autonomic innervation corresponds to the embryonic foregut, midgut, and hindgut divisions *(Table 4, page 27)*.

Each segment of the distal gastrointestinal tract has a different function regarding stool formation and movement. The primary function of the colon is water absorption; decreased transit time is associated with increased water absorption, leading to harder feces. The ascending and transverse colon are sites of fecal storage, and the descending and sigmoid colon are involved in fecal transport.[11] The anal canal is surrounded by both voluntary and involuntary muscles that exhibit tonic contraction to keep the anal canal closed and therefore prevent defecation. Retraction of both the external and internal anal sphincter allows for defecation.

MICROFLORA OF THE INTESTINES

The microflora of the intestines can be altered in pathologic states, including constipation. Gut microbial analysis has revealed that over 1,000 bacterial species can inhabit the human digestive system, with a relative predominance of Bacteriodetes and Firmicutes species.[14,15,16] The number and specific species of microbial organisms vary throughout the digestive tract, becoming more abundant and diverse distally. This is largely dependent on several factors including luminal pH, intestinal motility, mucus abundance, and acid secretion.

Intestinal microflora possibly contributes to the pathogenesis of several colonic conditions, including constipation. Bacterial abundance as well as bacterial species differ between healthy and constipated patients. One study comparing patients with refractory constipation to healthy volunteers found a decrease in probiotic bacteria (Bifidobacteria and Lactobacilli) but no significant difference in the predominant bacteria (Bacteriodetes, and Clostridium coccoides and Clostridium Upturn). Another study examining the gut micro-organisms of constipated patients found a decrease in Prevotella and an increase in Firmicutes, which presumably would result in an increase in butyrate production and possibly contribute to constipation. Substantial research has also been done on the microfloral components of both the constipation and diarrheal subsets of irritable bowel syndrome (IBS) patients, and it is thought that alterations in digestive microflora are linked to irritable bowel symptoms. This is likely due to gut inflammation, disruptions in the intestinal mucosa, and nerve involvement. Research has thus increased our understanding of the potential role that intestinal flora plays in colonic function.

EVALUATION

History

The initial evaluation of a patient presenting with constipation involves gathering a thorough medical history. The history should include onset of complaint, patient's definition of constipation, bowel movement frequency, stool consistency, medical history, medication and laxative use, fluid intake, dietary fiber intake, and exercise.[9] A surgical and gynecological history should be obtained as adhesions are implicated in chronic lower abdominal pain, constipation, and ileus. Symptoms such as bloating, pain, and malaise may suggest irritable bowel syndrome. Excessive straining as well as the need for perineal or vaginal pressure during defecation or direct digital evacuation of stools is suggestive of defecatory disorders. Asking for the presence of these symptoms is vital in identifying an evacuatory disorder as it does not respond to standard laxative therapy.[7]

Physical examination

Physical examination of the constipated patient should include examination of the abdomen, perineum, and rectum. The abdominal exam should assess for masses and hepatomegaly. Inguinal areas should be assessed for hernias and enlarged lymph nodes. The perineal exam should evaluate for external hemorrhoids, skin tags, anal warts, and fissures.[8,10] During the rectal exam, sphincter tone and anal reflex should be assessed as well as presence of rectocele or rectal masses.[9] To test for pelvic floor dysfunction, patients should be instructed to attempt to expel the examiner's finger. The anal sphincter and puborectalis muscle should normally relax and the perineum should descend. Pelvic floor dysfunction can also be assessed by having patients contract or squeeze the pelvic floor muscles which should result in lifting of the pelvic floor.

Osteopathic Structural Exam

The osteopathic structural exam expands on the physical exam described above by considering additional structural factors that can impact the function of the colon. This is based on the osteopathic tenet that structure and function are reciprocally inter-related. Proper colonic function depends on the balance of sympathetic and parasympathetic activity to the gut. Sympathetic stimulation results in decreased colonic muscle tone and contractility, therefore slowing fecal movement. Parasympathetic stimulation on the other hand leads to an increase in colonic muscle tone and contractility, as well as secretion of colorectal glands, facilitating stool transport. Inhibition of the sympathetics leads to unopposed output of the parasympathetics, or vice versa. In practice, proper recognition of the levels of autonomic innervation to the gastrointestinal tract allows the physician to target the osteopathic structural exam to evaluate for somatic dysfunction in key regions that can influence colonic activity *(Table 4)*.

Somatic dysfunction in the T10-L2 distribution should be specifically assessed as sympathetic facilitation from the colon is reflected in this region. Increased sympathetic output from the thoracic and lumbar region can reduce peristalsis and increase sphincter tone. The abdominal ganglia, consisting of the celiac, superior mesenteric, and inferior mesenteric sympathetic ganglia, can be assessed by palpating for tension and tenderness between the xyphoid process and umbilicus. The subocciput, pelvis, sacrum, and sacroiliac joint should be assessed as they may affect parasympathetic output via the vagus nerve and pelvic splanchnic nerves.[27] Lastly, both abdominal and pelvic diaphragm movement should be evaluated for any restrictions as these can have mechanical effects on the superior and inferior aspects of the abdominal cavity.

WORK-UP

Lab testing such as thyroid function tests, calcium, glucose, electrolyte levels, complete blood count, and urinalysis are frequently used in the evaluation of a constipated patient.[4] However, according to the American College of Gastroenterology Chronic Constipation Task Force, in patients without alarming signs or symptoms, there is inadequate data on the routine use of thyroid function tests, serum calcium, or other diagnostic tests. Metabolic testing such as glucose, calcium, and thyroid stimulating hormone levels are only recommended if the clinical presentation warrants it. For example, if signs or symptoms are indicative of organic disease such as hypothyroidism, specific diagnostic tests may be performed. The Task Force also states that there is inadequate data on the routine use of flexible sigmoidoscopy, colonoscopy, and barium enema in patients without alarming signs or symptoms.[2] However, in patients with symptoms such as new onset or worsening constipation, blood in stool, weight loss, fever, anorexia, nausea, vomiting, or family history of inflammatory bowel disease or colon cancer, a complete exam of the colon is required.[4] Additionally, routine colon cancer screening is recommended for patients starting at 50 years of age.[2]

TABLE 4:

Innervation and Blood Supply of the Gastrointestinal Tract[13,28,29,30]

Location	Sympathetics		Parasympathetics		Somatic Innervation	Arterial / Venous Supply
	Nerve (Vertebral Level)	Area to Examine	Nerve (Vertebral Level)	Area to Examine		
Mouth to Second Part of Duodenum (foregut)	Greater Splanchnic Nerve (T5 - T9)	T5 - T9	Vagus Nerve (Cranial Nerve X)	OA, C1 - C2	_____	Celiac Trunk / Splenic and Portal Veins
Third Part of Duodenum to Proximal 2/3 of Transverse Colon (midgut)	Lesser Splanchnic Nerve (T10 - T11)	T10 - T11	Vagus Nerve (Cranial Nerve X)	OA, C1 - C2	_____	Superior Mesenteric Artery / Vein
Distal 1/3 of Transverse Colon to Upper Anus, Internal Anal Sphincter (hindgut)	Lumbar Splanchnic Nerve (L1 - L2)	L1 - L2	Pelvic Splanchnic Nerve (S2 - S4)	Sacroiliac, Sacrum, Pelvis	_____	Inferior Mesenteric Artery / Vein
External Anal Sphincter	_____	_____	_____	_____	Pudendal Nerve and S4	Middle and Inferior Rectal (Internal Iliac) Arteries and Veins

Physiologic testing should only be done in patients with refractory constipation not due to a secondary cause or in patients that did not respond to a high fiber diet and laxatives.[4,7] Slow transit constipation is most commonly diagnosed with the Sitzmark transit study while obstructive defecation can be assessed using anorectal physiologic studies such as anorectal manometry and balloon expulsion test.[6,9,10]

TREATMENT

Lifestyle modifications including high fiber diet, exercise, and increased fluid intake may lead to symptomatic improvement.[10] Although lifestyle modifications are usually attempted prior to medical therapy, there are limited controlled trials supporting their use.[9,31] Available studies suggest benefit with these lifestyle measures only when there is a true deficiency present.[9] Patients with normal transit or slow transit constipation should gradually increase their dietary fiber intake to 20-25 g per day followed by supplement use if necessary.[4] Additionally, bowel retraining may be of benefit to the constipated patient. Bowel retraining, a type of behavior modification, involves developing a regular daily routine with time set aside for bowel movements, preferably after meals to utilize the gastrocolic reflex. Such a routine helps the patient recognize and respond to defecatory signals.

If lifestyle modifications do not improve symptoms, an osmotic laxative such as magnesium hydroxide or lactulose can be used. If this is not effective, polyethyelene glycol, another osmotic agent, should be used.[7,8] The American College of Gastroenterology Chronic Constipation Task force have found both polyethylene glycol (17 g/d) and lactulose (15-60 mL/d) to be effective in improving stool frequency and consistency.[2]

Other available pharmaceutical agents for constipation include bulking agents. A systematic review found good evidence for the use of the bulking agent psyllium.[31] Due to insufficient data, the American College of Gastroenterology Chronic Constipation Task Force has not made a recommendation on the use of other bulking agents such as calcium polycarbophil, methylcellulose, and bran. Additionally, the Task Force found that stool softeners had minimal effect on symptomatic control of chronic constipation. Tegaserod, a 5-HT4 selective agonist, has been well-studied and found to improve the frequency of bowel movements and stool consistency.[2,31] Other treatments such as stimulant laxatives, herbal supplements, lubricants, and combination laxatives have not been adequately studied for the Task Force to make a recommendation.[2] Of note, stimulant laxatives have been reported to be associated with cathartic colon which is characterized by colonic dilatation and loss of haustration. However, this effect is not associated with currently available stimulant laxatives and it remains debatable if long-term stimulant laxative use is associated with permanent damage to colonic mucosa or the enteric nervous system. Overuse of stimulant laxatives can reduce colonic tone leading to dependency on laxatives for defecation.

Probiotics have also been of interest as a possible treatment option for constipation. A systematic review of available studies found that there was symptomatic improvement following treatment

with Bifidobacterium lactis DN-173 010, Lactobacillus casei Shirota, and Escherichia coli Nissle 1917. However, additional studies with improved study design are needed in order to determine the role of probiotics in the treatment of constipation.[35,36]

For patients with defecatory disorders, patients can be retrained in the evacuation process by using biofeedback.[4,6,9] The goal of biofeedback is to restore a normal defecatory pattern by improving abdominal push effort, relaxing pelvic floor muscles, performing simulated defecation training, and enhancing rectal sensory perception. Biofeedback is recommended over laxative therapy for defecatory disorders.[7]

If symptoms persist, referral to a specialist may be necessary for further management.

ROLE OF OSTEOPATHIC MANIPULATIVE TREATMENT IN CONSTIPATION

OMT can improve functioning of the colon by normalizing the autonomic nervous system. Treating the abdominal and sympathetic chain ganglia and surrounding tissues allows for optimal functioning of the nerves and improved regulation of colonic tone, motility, and gastrointestinal secretions. In addition, OMT can address myofascial strains in the viscera and the structures that make up the abdominal cavity and thus help with colonic function from a mechanical perspective *(Table 5)*. A.T. Still, the founder of osteopathy, understood this when he described that constipation is propagated by dysfunction of the nervous system, fascia, mesentery, and peritoneum of the gut. He also described that constipated patients have a strain on their abdominal viscera and pelvic overcrowding, with the large bowels being forced into the pelvic cavity, blocking the passage of stool and fluid circulation. Visceral OMT on the abdomen improves the circulation of blood and lymph to and from the viscera which is required for the bowels and fecal matter to remain in a soft condition. Additionally, visceral OMT can decongest the intestines, improve smooth muscle tone, and reestablish the normal resilience, mobility, and motility of the involved organ.[26,40]

Myofascial treatments can address the abdominal container in which the intestines reside. The abdominal container is bordered by the abdominal muscles, lumbar muscles (e.g. psoas muscle), and the abdominal and pelvic diaphragms. Dysfunctions in these areas may cause or be the result of constipation. Therapies targeting pelvic floor hypertonicity can improve constipation symptoms. Treating the abdominal diaphragm can also aid in relieving abdominal distention. Potential OMT that can be used include iliopsoas muscle release and abdominal and pelvic diaphragm release. Prior to diaphragmatic release, thoracic outlet release should be performed to ensure maximal lymphatic and venous return.

Chapman's points, which are viscerosomatic reflex points, may also arise in response to constipation *(Table 6)*. These points represent visceral dysfunction and are mediated by the sympathetic nervous system. Additionally, they provide both diagnostic and therapeutic utility as treatment of the Chapman's points can break positive feedback cycles through the somatovisceral pathway.[26]

Two pilot studies have shown that OMT may play a role in constipation management. One study included 6 subjects with chronic constipation that were treated with techniques such as paraspinal inhibition, passive joint mobilization of the thoracolumbar spine, visceral techniques, and muscle energy technique to the sacro-pelvic region, thoracolumbar spine and atlanto-occipital joint. After six treatments over one month, subjects had significant improvement in symptom severity, colonic transit time, and quality of life.[40] A second study included 13 children with cerebral palsy that were diagnosed with chronic constipation. One study group received OMT which included fascial release, iliopsoas release, sphincter release, and bowel mobilization while the other group received OMT and medical therapy. Both groups had significant improvement from baseline evaluation.[44] Pilot studies have demonstrated the benefit of OMT in other gastrointestinal pathologies including irritable bowel syndrome and post-operative ileus[45,46] prompting the need for further research in the field.

Clinical Case

41-year-old male presents with chief complaint of straining during bowel movements and hard stools for 4 weeks. He has no past medical or surgical history and is currently not taking any medications. He denies melena, hematochezia, fever, and weight loss. Structural examination reveals T11-L2 bilateral paraspinal hypertonicity, tension/tenderness over the inferior mesenteric ganglion, and a restricted abdominal diaphragm.

OMT

From a neurological perspective, autonomic tone can be addressed by using paraspinal inhibition to T11-L2 and inferior mesenteric ganglion release, thereby normalizing sympathetic tone to the lower GI tract. From a mechanical/structural perspective, diaphragm releases, starting with thoracic outlet release, relieves tension in the myofascia allowing for maximal venous and lymphatic flow.

ROLE OF COMPLEMENTARY AND ALTERNATIVE (CAM) TREATMENT IN CONSTIPATION

Complementary and alternative medicine (CAM) therapies such as massage therapy, certain forms of acupuncture, and chiropractic care can potentially ameliorate constipation and have shown to be effective.[47,48] Discussion of these therapies is beyond the scope of this article, but exploring these alternative options is important due to the increasing frequency of constipation related emergency department visits, cases of constipation refractory to conservative medical treatment, and the associated costs of care.[49] There is also public awareness and interest in CAM,[50] so a basic understanding of such options can promote dialogue with the patient and enhance patient satisfaction.

TABLE 5:

Selected OMT techniques for treating constipation

Treatment Target	Treatment Goal	OMT
Autonomics	↓ Sympathetics	Rib Raising* Paraspinal inhibition* Ganglionic Release (celiac, superior, inferior)
	↑ Parasympathetics	Address restrictions to cervical area* (e.g. suboccipital release) Jugular foramen, and sacrum* (e.g. sacral rock)
Viscera	Remove restrictions to mesentery and flow of blood or lymph	Mesenteric Lift Colonic Stimulation ◊
Myofascia	Remove Restriction	Iliopsoas release*◊ Pelvic diaphragm release and Abdominal diaphragm release* (treat thoracic inlet first)

*Refer to reference 40 ◊ Refer to reference 44

TABLE 6:

Chapman's reflexes for gastrointestinal tract[43]

	Anterior Point	Posterior Point
Duodenum	Between the 8th and 9th ribs near the costochondral junction	Between T8 and T9 midway between the spinous processes and tips of the transverse processes
Jejunum	Between 9th and 10th ribs near the costochondral junction	Between T9 and T10 midway between the spinous processes and the tips of the transverse processes
Ileum	Between the 10th and 11th ribs near the costochondral junction	Between T10 and T11 midway between the spinous processes and tips of the transverse processes
Cecum	Upper one-fifth of the right thigh anteriorly on the tensor fascia lata	Triangular area from the transverse process of L2 to L4 and extending laterally to the iliac crest bilaterally
Ascending Colon	Middle three-fifths of the right thigh, on the anterior aspect of the iliotibial tract	
Right half of the transverse colon	Proximal to the right knee, on the anterior aspect of the iliotibial tract	
Left half of the transverse colon	Proximal to the left knee, on the anterior aspect of the iliotibial tract	
Descending Colon	Middle three-fifths of the left thigh on the anterior aspect of the iliotibial tract	
Sigmoid Colon	Upper one-fifth of the left thigh, anteriorly on the tensor fascia lata	
Rectum	Proximal inner thighs over the lesser trochanters	Sacrum, close to the ilium at the lower end of the sacroiliac articulation

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