

## Studies of Disturbed Gastrointestinal Motility in Irritable Bowel Syndrome

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GI Region	Finding	Reference
<b>Stomach</b>		
Emptying	Delayed emptying, particularly of solids	1;2 3
	Delayed emptying of solids more noticeable in IBS-C or those with overlapping functional dyspepsia	4
	Associated with dyspeptic symptoms	5
	Not associated with dyspeptic symptoms	1;5 3
Electrogastrogram (EGG)	Delayed emptying and lack of postprandial increase in EGG amplitude significantly correlated ( $r=0.8$ ; $p<0.005$ )	1
Phasic contractions	Anger suppresses antral contractility in IBS but increases it in healthy volunteers.	6*
<b>Small intestine</b>		
Discrete cluster contractions (DCCs)	Increased frequency and duration of DCC which can be associated with pain	7 8*9* 10
	No increase in DCC CRH increases DCCs	11* 12
Migrating motor complex	Increased frequency of MMCs	8* 13* 10
	Normal frequency of MMCs	11*
Prolonged propagating contractions (PPCs)	No frequency increase but can be associated with pain	8*
Retrograde contractions	Increased frequency during phase II of MMC	10;14
	Duodenal retrograde contractions correlate with worsening of symptoms in IBS-D ( $r=0.74$ , $p=0.01$ )	10

Phasic contractions	<p>Increased in response to meals, ileal distension and CCK</p> <p>Suppressed by stress</p> <p>Alteration in motility more noticeable in IBS-D than –C</p> <p>Colonic distension does not reduce duodenal motility in IBS but does in healthy volunteers, suggesting an impaired intestinal reflex</p>	<p>10;13*</p> <p>15</p> <p>8*;13*;9*;10</p> <p>16</p>
Transit	<p>Accelerated in IBS-D compared with IBS-C</p> <p>Accelerated in IBS-D</p>	<p>17</p> <p>18*</p>
<b>Colon and Rectum</b>		
Phasic contractions & myoelectrical activity	<p>Fasting similar in IBS patients overall to healthy volunteers</p> <p>Increased following meal ingestion, stress, CRH, CCK and recto-sigmoid distension, particularly those with IBS-D</p> <p>Normal following meal ingestion</p>	<p>19;20 21*;22*</p> <p>12;19;23;24;25*;26;27</p> <p>28;29;29;30</p> <p>31;32;33;34</p>
High amplitude propagating contractions (HAPCs)	<p>Increased in IBS-D</p> <p>90% associated with pain or cramp, and 40% occurred immediately prior to defecation.</p> <p>Decreased in IBS-C</p>	<p>27;35*</p> <p>36;37</p>
Compliance and tone	Normal colonic/rectal compliance under fasting conditions	30;38-40*;41-43

	Lower colonic/rectal compliance under fasting conditions	43;44*,45 46 47
	Normal colonic tone under fasting conditions	48*
	Reduced colonic tone under fed conditions	49;50*
	Increased rectal tone under fasting conditions	51;52
Transit	Accelerated in IBS-D	17;18*
	Delayed in IBS-C	17;53*,
	Whole gut and colonic transit accelerated in IBS-D, but normal in IBS-C	54

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IBS-D, irritable bowel syndrome with diarrhea; IBS-C, irritable bowel syndrome with constipation; DDC, discrete cluster contractions; PPCs, prolonged propagated contractions; HAPCs, high amplitude propagated contractions; MMC, migrating motor complex; CRH, corticotrophin-releasing hormone; CCK, cholecystokinin; EGG, electrogastrogram; \*, studies with < 10 subjects per subgroup.

#### Reference List

1. Van der Voort IR, Osmanoglou E, Seybold M, Heymann-Monnikes I, Tebbe J, Wiedenmann B *et al.* Electrogastrography as a diagnostic tool for delayed gastric emptying in functional dyspepsia and irritable bowel syndrome. *Neurogastroenterology and Motility* 2003;**15**:467-73.
2. Evans PR, Bak YT, Shuter B *et al.* Gastroparesis and small bowel dysmotility in irritable bowel syndrome. *Dig Dis Sci* 1997; **42**: 2087-93.
3. Van Wijk HJ, Smout AJPM, Akkermans LMA, Roelofs JMM, Ten Thije OJ. Gastric emptying and dyspeptic symptoms in the irritable bowel syndrome. *Scandinavian Journal of Gastroenterology* 1992;**27**:99-102.
4. Caballero-Plasencia AM, Valenzuela-Barranco M, Herrerias-Gutierrez JM, Esteban-Carretero JM. Altered gastric emptying in patients with irritable bowel syndrome. *Eur.J Nucl.Med* 1999;**26**:404-9.

5. Stanghellini V, Tosetti C, Barbara G, De Giorgio R, Cogliandro L, Cogliandro R *et al.* Dyspeptic symptoms and gastric emptying in the irritable bowel syndrome. *Am.J Gastroenterol.* 2002;**97**:2738-43.
6. Welgan P, Meshkinpour H, Ma L. Role of anger in antral motor activity in irritable bowel syndrome. *Digestive Diseases and Sciences* 2000;**45**:248-51.
7. Kumar D, Wingate DL. The irritable bowel syndrome: A proxysmal disorder. *Lancet* 1985;**2**:973-7.
8. Kellow JE, Phillips SF. Altered small bowel motility in irritable bowel syndrome is correlated with symptoms. *Gastroenterology* 1987;**92**:1885-93.
9. Kellow JE, Gill RC, Wingate DL. Prolonged ambulant recordings of small bowel motility demonstrate abnormalities in the irritable bowel syndrome. *Gastroenterology* 1990;**98**:1208-18.
10. Simren M, Castedal M, Svedlund J, Abrahamsson H, Bjornsson E. Abnormal propagation pattern of duodenal pressure waves in the irritable bowel syndrome (IBD). *Digestive Diseases and Sciences* 2000;**45**:2151-61.
11. Gorard DA, Libby GW, Farthing MJ. Ambulatory small intestinal motility in 'diarrhoea' predominant irritable bowel syndrome. *Gut* 1994;**35**:203-10.
12. Fukudo S, Nomura T, Hongo M. Impact of corticotropin-releasing hormone on gastrointestinal motility and adrenocorticotrophic hormone in normal controls and patients with irritable bowel syndrome. *Gut* 1998;**42**:845-9.
13. Kellow JE, Phillips SF, Miller LJ, Zinsmeister AR. Dysmotility of the small intestine in irritable bowel syndrome. *Gut* 1988;**29**:1236-43.
14. Schmidt T, Hackelsberger N, Widmer R, Meisel C, Pfeiffer A, Kaess H. Ambulatory 24-hour jejunal motility in diarrhea-predominant irritable bowel syndrome. *Scand.J Gastroenterol* 1996;**31**:581-9.
15. Kellow JE, Langeluddecke PM, Eckersley GM, Jones MP, Tennant CC. Effects of acute psychologic stress on small-intestinal motility in health and the irritable bowel syndrome. *Scand J Gastroenterol* 1992;**27**:53-8.

16. Fukudo S, Kanazawa M, Kano M, Sagami Y, Endo Y, Utsumi A *et al.* Exaggerated motility of the descending colon with repetitive distention of the sigmoid colon in patients with irritable bowel syndrome. *J Gastroenterol.* 2002;**37 Suppl 14**:145-50.
17. Cann PA, Read NW, Brown C, Hobson N, Holdsworth CD. Irritable bowel syndrome: relationship of disorders in the transit of a single solid meal to symptom patterns. *Gut* 1983;**24**:405-11.
18. Vassallo M, Camilleri M, Phillips SF, Brown ML, Chapman NJ, Thomforde GM. Transit through the proximal colon influences stool weight in the irritable bowel syndrome. *Gastroenterology* 1992;**102**:102-8.
19. McKee DP, Quigley EM. Intestinal motility in irritable bowel syndrome: is IBS a motility disorder? Part 1. Definition of IBS and colonic motility. *Dig.Dis.Sci.* 1993;**38**:1761-72.
20. Katschinski M, Lederer P, Ellermann A, Ganzleben R. Myoelectric and manometric patterns of human rectosigmoid colon in irritable bowel syndrome and diverticulosis. *Scandinavian Journal of Gastroenterology* 1990;**25**:761-8.
21. Hamdorf JM, Ingram DM, Sallie RJ, Hoffman NE. The Motility of the Colon in the Irritable Bowel Syndrome. *Hepato-Gastroenterology* 1988;**35**:208.
22. Rogers J, Misiewicz JJ. Increased Intraluminal Pressures and Activity in the Sigmoid Colon of Patients with the Irritable Bowel Syndrome. *Hepato-Gastroenterology* 1988;**35**:209.
23. Drossman DA, Camilleri M, Mayer EA, Whitehead WE. AGA technical review on irritable bowel syndrome. *Gastroenterology* 2002;**123**:2108-31.
24. Narducci F, Bassotti G, Granata MT, Pelli MA, Gaburri M, Palumbo R *et al.* Colonic motility and gastric emptying in patients with irritable bowel syndrome. Effect of pretreatment with octylonium bromide. *Dig.Dis.Sci.* 1986;**31**:241-6.
25. Rogers J, Henry MM, Misiewicz JJ. Increased segmental activity and intraluminal pressures in the sigmoid colon of patients with the irritable bowel syndrome. *Gut* 1989;**30**:634-41.

26. Sullivan MA, Cohen S, Snape WJJ. Colonic myoelectrical activity in irritable-bowel syndrome. Effect of eating and anticholinergics. *N.Engl.J Med.* 1978;**298**:878-83.
27. Chey WY, Jin HO, Lee MH, Sun SW, Lee KY. Colonic motility abnormality in patients with irritable bowel syndrome exhibiting abdominal pain and diarrhea. *Am.J.Gastroenterol.* 2001;**96**:1499-506.
28. Welgan P, Meshkinpour H, Beeler M. Effect of anger on colon motor and myoelectric activity in irritable bowel syndrome. *Gastroenterology* 1988;**94**:1150-6.
29. Harvey RF, Read AE. Effect of cholecystokinin on colonic motility and symptoms in patients with the irritable bowel syndrome. *Lancet* 1973;**1**:1-6.
30. Whitehead WE, Engel BT, Schuster MM. Irritable bowel syndrome: physiological and psychological differences between diarrhea-predominant and constipation-predominant patients. *Dig.Dis.Sci.* 1980;**25**:404-13.
31. Trotman IF, Misiewicz JJ. Sigmoid motility in diverticular disease and the irritable bowel syndrome. *Gut* 1988;**29**:218-22.
32. Misiewicz JJ, Connell AM, Pontes FA. Comparison of Effect of Meals and Prostigmine on Proximal and Distal Colon in Patients with and Without Diarrhoea. *Gut* 1966;**7**:468-73.
33. Wangel AG, Deller DJ. Intestinal Motility in Man .3. Mechanisms of Constipation and Diarrhea with Particular Reference to Irritable Colon Syndrome. *Gastroenterology* 1965;**48**:69-84.
34. Welgan P, Meshkinpour H, Hoehler F. The effect of stress on colon motor and electrical activity in irritable bowel syndrome. *Psychosom.Med.* 1985;**47**:139-49.
35. Bazzocchi G, Ellis J, Villanueva-Meyer J, Reddy SN, Mena I, Snape WJ, Jr. Effect of eating on colonic motility and transit in patients with functional diarrhea. Simultaneous scintigraphic and manometric evaluations. *Gastroenterology* 1991;**101**:1298-306.
36. Bassotti G, Chistolini F, Marinozzi G, Morelli A. Abnormal colonic propagated activity in patients with slow transit constipation and constipation-predominant irritable bowel syndrome. *Digestion.* 2003;**68**:178-83.

37. Bazzocchi G, Ellis J, Villanueva-Meyer J, Jing J, Reddy SN, Mena I *et al.* Postprandial colonic transit and motor activity in chronic constipation. *Gastroenterology* 1990;**98**:686-93.
38. Munakata J, Naliboff B, Harraf F, Kodner A, Lembo T, Chang L *et al.* Repetitive sigmoid stimulation induces rectal hyperalgesia in patients with irritable bowel syndrome. *Gastroenterology* 1997;**112**:55-63.
39. Lembo T, Munakata J, Mertz H, Niazi N, Kodner A, Nikas V *et al.* Evidence for the hypersensitivity of lumbar splanchnic afferents in irritable bowel syndrome. *Gastroenterology* 1994;**107**:1686-96.
40. Bradette M, Delvaux M, Staumont G, Fioramonti J, Bueno L, Frexinos J. Evaluation of colonic sensory thresholds in IBS patients using a barostat. Definition of optimal conditions and comparison with healthy subjects. *Dig.Dis.Sci.* 1994;**39**:449-57.
41. Zighelboim J, Talley NJ, Phillips SF, Harmsen WS, Zinsmeister AR. Visceral perception in irritable bowel syndrome. Rectal and gastric responses to distension and serotonin type 3 antagonism. *Dig Dis Sci* 1995;**40**:819-27.
42. Penning C, Steens J, van der Schaar PJ, Kuyvenhoven J, Delemarre JB, Lamers CB *et al.* Motor and sensory function of the rectum in different subtypes of constipation. *Scand.J Gastroenterol.* 2001;**36**:32-8.
43. Kwan CL, Davis KD, Mikula K, Diamant NE. Abnormal rectal motor physiology in patients with irritable bowel syndrome. *Neurogastroenterology and Motility* 2004;**16**:251-63.
44. Hammer J, Phillips SF, Talley NJ, Camilleri M. Effect of a 5HT<sub>3</sub>-antagonist (ondansetron) on rectal sensitivity and compliance in health and the irritable bowel syndrome. *Aliment Pharmacol Ther* 1993;**7**:543-51.
45. Slater BJ, Plusa SM, Smith AN, Varma JS. Rectal hypersensitivity in the irritable bowel syndrome. *International Journal of Colorectal Disease* 1997;**12**:29-32.
46. Steens J, van der Schaar PJ, Penning C, Brussee J, Masclee AA. Compliance, tone and sensitivity of the rectum in different subtypes of irritable bowel syndrome. *Neurogastroenterol.Motil.* 2002;**14**:241-7.
47. Kwan CL, Diamant NE, Mikula K, Davis KD. Characteristics of rectal perception are altered in irritable bowel syndrome. *Pain* 2005;**113**:160-71.

48. Vassallo MJ, Camilleri M, Phillips SF, Steadman CJ, Talley NJ, Hanson RB *et al.* Colonic tone and motility in patients with irritable bowel syndrome. *Mayo Clin Proc* 1992;**67**:725-31.
49. O' Brien MD, Camilleri M, vonderOhe MR, Phillips SF, Pemberton JH, Prather CM *et al.* Motility and tone of the left colon in constipation: A role in clinical practice? *American Journal of Gastroenterology* 1996;**91**:2532-8.
50. Choi MG, Camilleri M, O'Brien MD, Kammer PP, Hanson RB. A pilot study of motility and tone of the left colon in patients with diarrhea due to functional disorders and dysautonomia. *Am.J Gastroenterol.* 1997;**92**:297-302.
51. Whitehead WE, Crowell MD, Davidoff AL, Palsson OS, Schuster MM. Pain from rectal distension in women with irritable bowel syndrome: relationship to sexual abuse. *Dig Dis Sci* 1997;**42**:796-804.
52. Blomhoff S, Spetalen S, Jacobsen MB, Vatn M, Malt UF. Rectal tone and brain information processing in irritable bowel syndrome. *Digestive Diseases and Sciences* 2000;**45**:1153-9.
53. Stivland T, Camilleri M, Vassallo M, Proano M, Rath D, Brown M *et al.* Scintigraphic measurement of regional gut transit in idiopathic constipation. *Gastroenterology* 1991;**101**:107-15.
54. Horikawa Y, Mieno H, Inoue M, Kajiyama G. Gastrointestinal motility in patients with irritable bowel syndrome studied by using radiopaque markers. *Scand J Gastroenterol* 1999;**34**:1190-5.