Journal of the Canadian Association of Gastroenterology, 2021, 4(1), 1–2
doi: 10.1093/jcag/gwaa011
Image of the Month
Advance Access publication 27 March 2020

OXFORD

Image of the Month

The Defecation Reflex Assessed by High-Resolution Colonic Manometry

Ji-Hong Chen, MD, PhD, Natalija Milkova, BSc, Lijun Liu, BSc, Jan D. Huizinga, PhD

Division of Gastroenterology, Department of Medicine, Farncombe Family Digestive Health Research Institute, McMaster University, Hamilton, Ontario, Canada

Correspondence: Jihong Chen, MD, PhD, Division of Gastroenterology, Department of Medicine, Farncombe Family Digestive Health Research Institute, McMaster University, 1280 Main Street West, Hamilton, Ontario L8S 4L8, Canada, e-mail: Chen338@mcmaster.ca

Patients with severe refractory chronic constipation remain a challenge for gastroenterologists. A major roadblock is that the assessment of the underlying pathophysiology is difficult and hence treatment, including, although rare, surgery, is often based on assumptions. With high-resolution colonic manometry (HRCM), we can answer the question whether or not the patient is capable of executing the defecation reflex. Can the colon generate the motor patterns upon rectal stimulation that are necessary for stool evacuation? Recently, we published responses to stimuli in healthy subjects (1,2) using a probe that senses intraluminal pressure at 84 sites, 1 cm apart, throughout the colon. To assess the defecation reflex, we give bisacodyl in the rectum and observe the evoked motor patterns. Figure 1 illustrates that upon rectal stimulation, after a

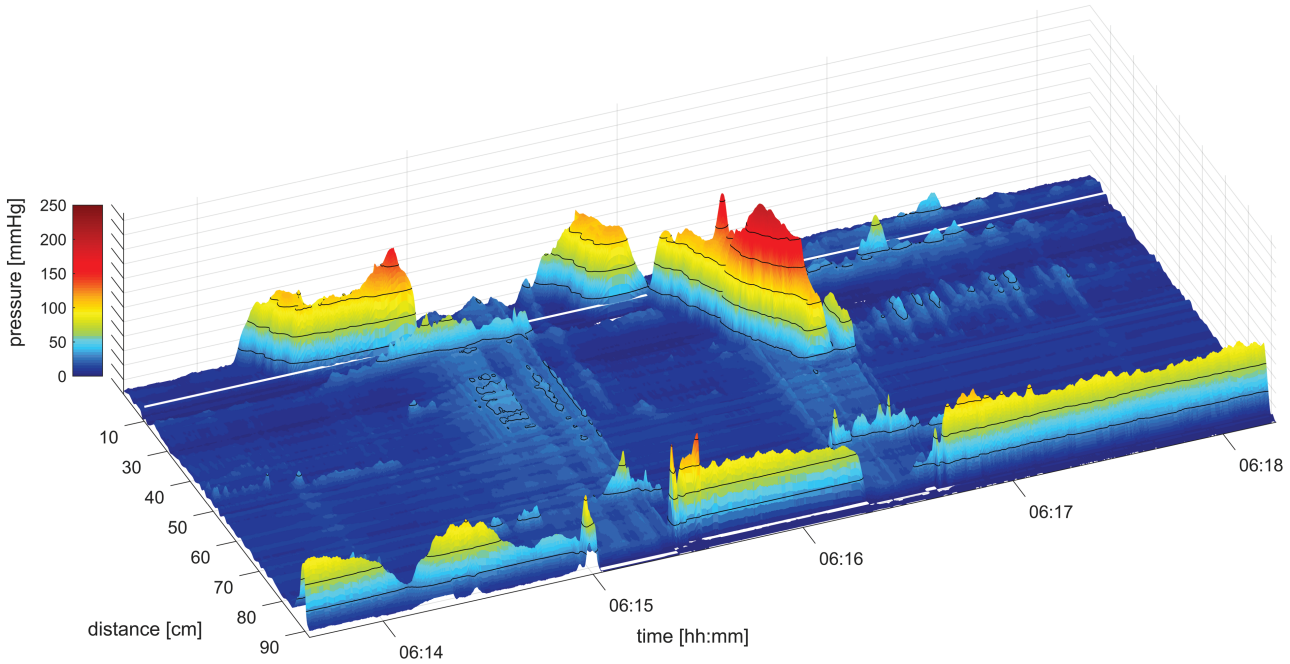

Figure 1. A three-dimensional surface plot of 5-minute high-resolution colonic manometry, evoking the defecation reflex in a healthy subject. Ten milligrams of bisacodyl, given in the rectum, initiate, after a delay of 6 minutes, a proximal high-amplitude propagating pressure wave (HAPW) with subsequent simultaneous pressure waves (SPWs) and anal sphincter relaxation. It is followed by another HAPW, which progresses into the descending colon, is followed again by low amplitude SPWs and full anal sphincter relaxation. The y-axis shows cm distance between proximal colon and rectum with the white line representing a 10 cm gap where a balloon is located. The x-axis shows time since the start of the assessment (for details, see reference (1)).

6-minute delay there is a response with high-amplitude propagating pressure waves that start in the proximal colon, develop into simultaneous pressure waves (3) followed by anal sphincter relaxation, indicating that a normal defecation reflex can be evoked by pharmacological means. Note that autonomous coordination between propulsive motor activity and anal sphincter relaxation is an essential part of the defecation reflex but is not measured by standard anorectal manometry. Bisacodyl acts on rectal mucosal enterocytes to then stimulate sensory nerves, activating nerves in the sacral defecation center. This information goes up the spinal pathways (4), to stimulate vagal innervation of the proximal colon which can evoke motor patterns throughout the colon and anal sphincters. HRCM studies in the coming years will lead to an explosion of knowledge in the field of colonic motility, thus deepening our understanding of the pathophysiology of patients with severe constipation and allowing us to use this newfound knowledge to provide the best treatment.

References

1. Milkova N, Ratcliffe E, Huizinga JD, Chen J-H. On the nature of high-amplitude propagating pressure waves in the human colon. Am J Physiol Gastrointest Liver Physiol 2020;318:G646–G660. doi:10.1152/ajpgi.00386.2019.
2. Pervez M, Ratcliffe E, Parsons SP, Chen J-H, Huizinga JD. The cyclic motor patterns in the human colon. Neurogastroenterol Motil 2020; e13807:1–17. doi.org/10.1111/nmo.13807.
3. Chen J-H, Parsons SP, Shokrollahi M, et al. Characterization of simultaneous pressure waves as biomarkers for colonic motility assessed by high-resolution colonic manometry. Front Physiol 2018;9:1248. doi:10.3389/fphys.2018.01248.
4. Yuan Y, Ali MK, Mathewson KJ, et al. Associations between colonic motor patterns and autonomic nervous system activity assessed by high-resolution manometry and concurrent heart rate variability. Front Neurosci 2020;13:1447. doi:10.3389/fnins.2019.01447.