

Are Bloating and Abdominal Distention Attributed to Gas Production and Visceral Sensitivity in Irritable Bowel Syndrome?

(Am J Gastroenterol 2013;108:1516-1525)

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Summary

Bloating and abdominal distension are common symptoms in patients with irritable bowel syndrome (IBS). Bloating is considered as a subjective sensation and abdominal distention as an objective sign, i.e., the visible increase in abdominal girth.^{1,2} They can be related to each other or not.

Recently, Zhu et al³ evaluated the effects of dietary factors on abdominal bloating and distention and the underlying pathophysiology in IBS. More specifically, they assessed the effects of gas production and visceral hypersensitivity on gastrointestinal (GI) symptoms after lactose ingestion in a population with lactase deficiency. IBS patients ($n = 277$) and healthy controls (HCs, $n = 64$) underwent a 20 g lactose hydrogen breath test (LHBT) for evaluation of hydrogen gas production and lactose intolerance (LI) symptoms. Cumulative breath hydrogen excretion was quantified by measuring areas under the curve during LHBT. Five digestive symptoms characteristic of LI (bloating, borborygmi, nausea, pain and diarrhea) were recorded at 15-minute in-

tervals on a scale of 0-4 for 3 hours. Subjects who reported more than one point rise in LI symptoms during the LHBT were diagnosed as LI. Abdominal girth (199 IBS, 40 HCs) was measured in the standing and supine position, before and after LHBT, to evaluate the abdominal distension, using an inextensible metric tape measure over the umbilicus. Abdominal distention was defined to be increased by a minimum distention level of ≥ 0.5 cm. Rectal sensitivity (74 IBS, 64 HCs) was assessed by barostat studies and visceral hypersensitivity was defined as below the 5.0 percentile limit for sensory threshold to discomfort/pain obtained from HCs. In the results, cumulative hydrogen excretion (AUC) during LHBT showed no difference between the groups ($P = 0.485$) and the prevalence of abdominal distention after lactose ingestion (standing: 58% vs. 72.5%, $P = 0.083$; supine: 65% vs. 75%, $P = 0.213$) was similar. In contrast, LI was more frequent in IBS (53.8 vs. 28.1%, $P < 0.001$), especially bloating (39.0 vs. 14.1%, $P < 0.001$) and borborygmi (39.0 vs. 21.9 %, $P = 0.010$). Only 59.0% of patients with bloating had distention. Hydrogen production as well as bloating score was not associated with girth increment. In the multivariate analysis for the factors

Received: September 18, 2013 Revised: None Accepted: September 18, 2013

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Financial support: None.

Conflicts of interest: None.

associated with LI symptom severity, hydrogen production increased bloating (odds ratio [OR], 2.19; 95% confidence interval [CI], 1.09-4.39; $P = 0.028$) and borborygmi (OR, 12.37; 95% CI, 3.34-45.83; $P < 0.001$) but not distention ($P = 0.673$). Visceral hypersensitivity was associated with bloating (OR, 6.61; 95% CI, 1.75-25.00; $P = 0.005$) and total symptom score (OR, 3.78; 95% CI, 1.30-10.99; $P = 0.014$). The authors concluded that hydrogen gas production and visceral hypersensitivity both contribute to bloating and borborygmi, in IBS patients after lactose ingestion. Objective abdominal distention is not correlated with subjective bloating as well as gas production.

Comments

Bloating and abdominal distention occur commonly, especially in the functional GI disorders. In a population-based study in Olmsted County in the United States, the overall prevalence for bloating was 19% and 9% for abdominal distention.⁴ In a US study of an academic university clinic, 76% of 542 patients with IBS reported abdominal bloating.⁵

Bloating and distention have been attributed to excessive intestinal gas accumulation.^{6,7} But, the role of intestinal gas production as a cause of bloating and distention is controversial to date. Some reported increased hydrogen excretion in IBS patients compared with HCs,^{8,9} whereas others showed no difference.^{10,11} Also, many other studies do not support that excessive gas induces bloating or abdominal pain. In a study using argon wash-out technique, there was no difference in the accumulation of intestinal gas between patients with bloating and healthy subjects.¹² The study using CT scans combined with imaging analysis software has shown that excess gas was not associated with abdominal bloating in most patients.¹³ Other proposed underlying mechanisms of bloating and distention include impaired gas handling, altered gut motility, abnormal abdominal-diaphragmatic reflex, weakness of abdominal wall musculature, visceral hypersensitivity, intraluminal contents, food intolerance and carbohydrate malabsorption, small intestinal bacterial overgrowth, altered gut microflora and psychological factors.^{1,2,14} However, bloating and distention still remain to be incompletely understood and are considered challenging to treat in clinical practice.

To gain insight into the causes of bloating and distention, Zhu et al³ evaluated the effects of gas production after lactose ingestion and visceral hypersensitivity on bloating and abdominal distention, and the factors that increased the risk of these symptoms in IBS patients with lactase deficiency. Hydrogen gas pro-

duction was similar between IBS and HCs and not associated with abdominal girth increase. It was only correlated with bloating and borborygmi scores in IBS. No similar correlation was found between gas production and symptoms in HCs. These findings indicate that not only gas production is associated with bloating and borborygmi, but also other factors must be present to lead to bloating in IBS patients, especially visceral hypersensitivity, and those might be more important than intestinal gas increment. Zhu et al³ found that visceral hypersensitivity was more frequent in IBS patients and significantly associated with bloating and borborygmi. However, there was no significant correlation between rectal sensory thresholds and LI symptom severity, so further studies were recommended to determine the relationship between visceral hypersensitivity and bloating. In addition, impaired intestinal gas handling also may be assessed as one of the underlying mechanisms of bloating that was not dealt in this study.

In this study, abdominal distention was present in more than half of each group (IBS and HCs); however, consistent with previous studies,^{4,15} there was no association between distention and gas production or bloating. These findings indicate that mechanisms of abdominal distention may be different from those of bloating.^{1,16} Redistribution of abdominal contents due to diaphragmatic descent and abnormal relaxation of the abdominal wall, that is to say abnormal viscerosomatic reflexes, might be associated with distention rather than excessive retention of intestinal gas.^{17,18}

This study was prospectively conducted in a large cohort of IBS patients and HCs using a validated dietary intervention on bloating and distention, but has also several limitations, some of that were addressed in the paper. First, all subjects did not undergo every physiological measurement, especially rectal sensory thresholds. Second, diarrhea-predominant IBS patients made up 80% and non-constipated IBS 96% of the whole cohort, so these results may not be relevant to other subtypes, in particular constipation-predominant IBS. Also, this study was performed mainly in IBS patients with lactase deficiency. So, it may not be generalized to all IBS patients and further studies are needed to investigate the effects of gas production and visceral hypersensitivity on bloating and distention in IBS patients without lactase deficiency. Third, only hydrogen gas was assessed as a measure of carbohydrate malabsorption; measurement of other gases (e.g., methane) that may cause bloating and distention is also needed.

In conclusion, this study showed that both gas production

and visceral hypersensitivity contribute to bloating and borborygmi, but not distention. The authors suggested the roles of diets on bloating and abdominal distention, and the hydrogen gas and visceral hypersensitivity as the underlying mechanisms of those symptoms in IBS. Although this study has several limitations, these results can be applicable to functional GI symptoms associated with diets in many IBS patients, and may guide dietary and medical managements.

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