

Proton Pump Inhibitors Reduce the Size and Acidity of the Gastric Acid Pocket

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Summary

Gastric acid pocket is a portion of unbuffered acid accumulations in the proximal stomach during postprandial period. It could be a reservoir of acid reflux in patients with gastroesophageal reflux disease (GERD). How proton pump inhibitors (PPIs) control the acid pocket is rarely known.

Recently, Rohof et al¹ reported PPIs might change the size, acidity, or position of the acid pocket, which contribute to the therapeutic effect in patients with GERD. Concurrent high resolution manometry and pH-impedance monitoring were performed in 36 patients with GERD (18 on PPIs and 18 off PPIs) after a standardized meal. The acid pocket was visualized using scintigraphy, and its size and position were measured using radionuclide markers. The pH of acid pocket was measured in its aspirates. In patients on PPIs, the number of acid reflux episodes was reduced, and the acid pocket was smaller and more frequently located below the diaphragm, and the mean pH of acid pocket was significantly higher. The number of reflux events was not altered by PPIs. It is interesting to show the acid pocket itself with and reflux episodes through a large hiatal hernia using scintigraphic images by the ^{99m}Tc-pertechnetate-labeling.

Comments

The concept of acid pocket was demonstrated first by Fletcher et al,² who performed pH pull-through measurements in healthy subjects to check variations of intragastric pH from distal to more proximal regions of the stomach. They showed an area of more acidic gastric juice near the esophagogastric junction after a meal.

The acid pocket extends for 2-3 cm and results from layering of gastric juice on top of the meal in the fundus, because there was no strong peristaltic contractions occurring in the fundus and mixing is less pronounced.³ The acid pocket and its relationship with acid reflux could be shown in healthy subjects and GERD. However, in patients with GERD, the acidified segment extends higher up into the lower esophageal sphincter and distal esophagus, especially in patients with large hiatal hernia.⁴⁻⁶ Therefore, pharmacological intervention for the acid pocket will be issued.

Alginates are natural polysaccharide polymers, that on contact with gastric acid, precipitate into a viscous gel of near neutral pH within minutes.⁷ Many evidences have been emerging that alginates may act directly on the acid pocket.⁸⁻¹¹ An alginate-antacid formulation (Gaviscon double action liquid) was localized in the acid-pocket and reduced postprandial acid reflux.¹⁰ An alginate-antacid formulation was more effective than an antacid with-

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out alginate in lowering postprandial esophageal acid exposure.¹¹ Main effectiveness of alginate-antacid formulation relates to its co-localization and displacement/neutralization of postprandial acid pocket, rather than reducing reflux.

In the present study, the authors demonstrated that PPIs did not decrease the number of reflux events, but PPI treatment reduced the number of acid reflux, and reduced the size and acidity of the acid pocket, and altered position of the acid pocket after a meal. Increase in the nadir pH of the reflux events was associated strongly with the increased pH of the acid pocket by PPIs. Although the acid pocket could be one possible cause of refractory GERD, PPIs have still potent effectiveness to control the acid pocket too. New interventions which include GABA- β agonist, a physical barrier augmentation by fundoplication, new generation of PPIs, raft formation such as alginates or other reflux inhibitors will be studied in patients with refractory GERD.

References

1. Rohof WO, Bennink RJ, Boeckxstaens GE. Proton pump inhibitors reduce the size and acidity of the acid pocket in the stomach. *Clin Gastroenterol Hepatol* 2014;12:1101-1107, e1.
2. Fletcher J, Wirz A, Young J, Vallance R, McColl KE. Unbuffered highly acidic gastric juice exists at the gastroesophageal junction after a meal. *Gastroenterology* 2001;121:775-783.
3. Goetze O, Treier R, Fox M, et al. The effect of gastric secretion on gastric physiology and emptying in the fasted and fed state assessed by magnetic resonance imaging. *Neurogastroenterol Motil* 2009;21:725, e42.
4. Clarke AT, Wirz AA, Manning JJ, et al. Severe reflux disease is associated with an enlarged unbuffered proximal gastric acid pocket. *Gut* 2008;57:292-297.
5. Grigolon A, Cantú P, Bravi I, et al. Subcardial 24-h wireless pH monitoring in gastroesophageal reflux disease patients with and without hiatal hernia compared with healthy subjects. *Am J Gastroenterol* 2009;104:2714-2720.
6. Beaumont H, Bennink RJ, de Jong J, Boeckxstaens GE. The position of the acid pocket as a major risk factor for acidic reflux in healthy subjects and patients with GORD. *Gut* 2010;59:441-451.
7. Mandel KG, Daggly BP, Brodie DA, Jacoby HI. Review article: alginate-raft formulations in the treatment of heartburn and acid reflux. *Aliment Pharmacol Ther* 2000;14:669-690.
8. Kwiatek MA, Roman S, Fareeduddin A, et al. An alginate-antacid formulation (Gaviscon Double Action Liquid) can eliminate or displace the postprandial 'acid pocket' in symptomatic GERD patients. *Aliment Pharmacol Ther* 2011;34:59-66.
9. Sweis R, Kaufman E, Anggiansah A, et al. Post-prandial reflux suppression by a raft-forming alginate (Gaviscon Advance) compared to a simple antacid documented by magnetic resonance imaging and pH-impedance monitoring: mechanistic assessment in healthy volunteers and randomized, controlled, double-blind study in reflux patients. *Aliment Pharmacol Ther* 2013;37:1093-1102.
10. Rohof WO, Bennink RJ, Smout AJ, Thomas E, Boeckxstaens GE. An alginate-antacid formulation localizes to the acid pocket to reduce acid reflux in patients with gastroesophageal reflux disease. *Clin Gastroenterol Hepatol* 2013;11:1585-1591.
11. De Ruigh A, Roman S, Chen J, Pandolfino JE, Kahrilas PJ. Gaviscon Double Action Liquid (antacid & alginate) is more effective than antacid in controlling post-prandial oesophageal acid exposure in GERD patients: a double-blind crossover study. *Aliment Pharmacol Ther* 2014;40:531-537.