

Two-Dimensional Bowel Sound Mapping Predicts Therapeutic Response in Nonulcer Dyspepsia

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1. Introduction: Computerized auscultation patterns (enterotachograms), a surrogate marker of motility, have been found to be a useful objective measurement in characterizing functional bowel patients (Craine *et al*, Dig. Dis Sciences 46:1974-79, 2001). The goal of this research was to determine if two-dimensional mapping of gastrointestinal sounds could help identify nonulcer dyspepsia patients (NUD) that respond to proton pump inhibitors (PPI).

2. Methods: Patients attending a gastroenterology clinic diagnosed with NUD (n=20), on the basis of clinical symptoms and a normal upper endoscopy, were studied with computerized auscultation in the fasting state. Sounds were recorded simultaneously from three electronic stethoscopes held in a position of an equilateral triangle (see Figure 1). Computer analysis determined the location of the sounds by triangulation. The sounds per minute in the gastric region and the right lower quadrant (RLQ) were determined. Response to PPI was measured by determining if the patient felt there was at least a fifty percent improvement in symptoms, scored using a binary scale (Yes/No). Presence of *H. pylori* antibodies was determined using a blood serum test. The performance of the measurements in predicting clinical status was measured by the area under the curve (AUC) after a relative operating characteristic statistical analysis.

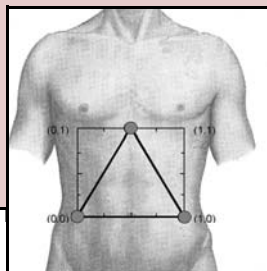


Figure 1. Placement of stethoscope heads.

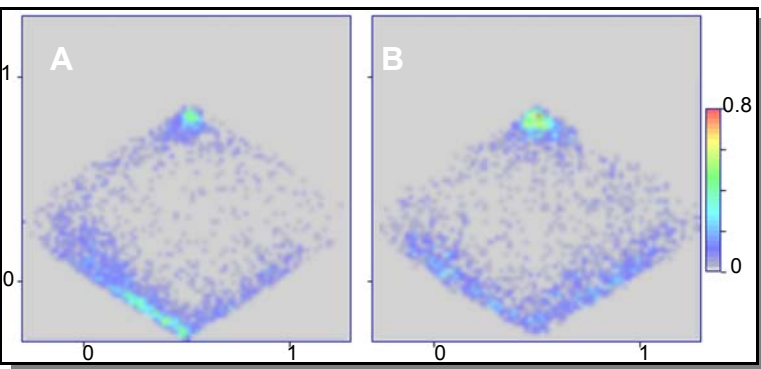


Figure 2. Mapping of percent of total sounds to coordinates on the surface of the abdomen. A) non-responders, B) responders to PPI treatment. Scale is percent of total sounds.

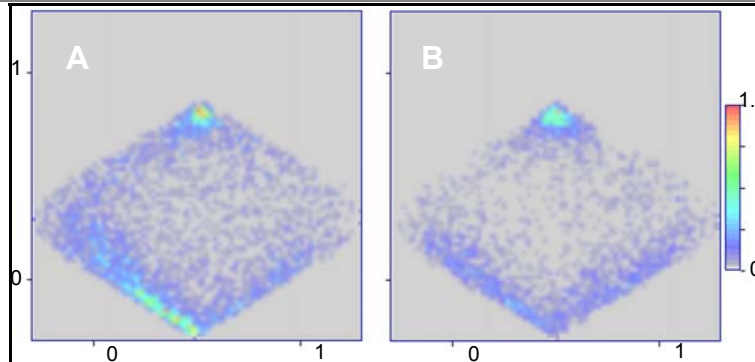


Figure 3. Mapping of sounds per minute (spm) to coordinates on the surface of the abdomen. A) non-responders, B) responders to PPI treatment. Scale is spm.

3. Results: The relative distribution of sounds showed an increased prevalence in the gastric area for the responders (Figure 2). The distribution of frequency of occurrence (i.e. spm) showed a similar rate in the gastric area between groups, but an increase in the RLQ for the non-responders (Figure 3). The sounds per minute (spm) originating in the RLQ predicted a response to PPI significantly better than chance ($P < 0.0001$, see Table 1). Patients with an spm greater than 40 in the RLQ, characteristic of irritable bowel patients [ibid.], were less likely to respond. The spm originating in the gastric area was not significant in predicting response to PPI. Rates of sound production in either region were no better than chance at predicting *H. pylori* status.

Table 1. Prediction of therapeutic response or *H. pylori* status.

Metric	<i>H. pylori</i> status		PPI Responsive		NTT [‡]
	AUC(%)*	P [†]	AUC(%)	P	
Gastric (spm)	57.0	0.29	61.5	0.189	1.6
RLQ (spm)	54.0	0.39	96.0	<0.0001	1.4
None	--	--	--	--	2.0

*AUC(%), area under the curve of relative operating characteristic curve

[†]P, probability result is equal to chance.

[‡]NTT, numbers to treat when using metric to pick treatment.

4. Conclusion: Nonulcer dyspepsia responsive to PPI's can be objectively predicted using two-dimensional positional mapping of gastrointestinal sounds. Two-dimensional positional mapping of bowel sounds can predict a therapeutic response to acid suppression in NUD patients significantly better than chance. NUD patients with enterotachogram measurements characteristic of irritable bowel syndrome were less likely to respond to PPI.