

Acupuncture and Integrative Medicine for Pediatric Gastroesophageal Reflux and Functional Dyspepsia

Mia Kanak, MPH, MD,¹ K.T. Park, MD, MS,² and Ann Ming Yeh, MD²

ABSTRACT

Background: Acupuncture for gastroesophageal reflux disease (GERD) and functional dyspepsia (FD), while not previously described in a pediatric cohort, may be a safe and effective alternative to pharmacologic treatment. This article provides a description of the authors' experience in treating children with refractory GERD or FD wherein acupuncture was used as a part of an integrative medicine treatment approach.

Materials and Methods: A retrospective chart review was performed from 2013 to 2014.

Results: Seven patients were treated: 5 of 6 reported reduction of nausea and 3 of 4 reported reductions in pain. Four of 4 patients were successfully weaned off proton pump inhibitors. The patients in this cohort tolerated acupuncture very well.

Conclusions: Acupuncture in children is well-tolerated and safe, and has minimal adverse effects. It may be an effective adjunct to standard care for treating children with GERD or FD.

Key Words: Acupuncture, Integrative Medicine, Functional Dyspepsia, GERD

INTRODUCTION

GASTROESOPHAGEAL REFLUX DISEASE (GERD) and functional dyspepsia (FD) are common problems in the pediatric population, with up to 7% of school-age children and 8% of adolescents experiencing epigastric pain, "heartburn," and regurgitation. Reflux is defined as the passage of stomach contents into the esophagus, while GERD refers to reflux symptoms associated with symptoms or complications—such as pain, asthma, aspiration pneumonia, or chronic cough. FD, as defined by the Rome III classification, is a persistent upper abdominal pain or discomfort, not related to bowel movements and without any organic cause, that is present for at least 2 months prior to diagnosis.¹ Endoscopic examination typically yields negative results in FD, whereas patients with GERD may have evidence of esophagitis or gastritis either grossly or microscopically. Pharmacologic treatment for GERD and dyspep-

sia requires acid blockade, which may have other unintended side-effects.¹

Acupuncture and integrative medicine (IM) therapies may offer a safe and effective alternative approach to GERD and FD. Traditional Chinese Medicine (TCM) combined with IM may offer alternative treatment options for patients whose conditions are refractory to standard care. IM is defined as healing-oriented medicine that considers the whole person, including all aspects of lifestyle. IM emphasizes the therapeutic relationship between the practitioner and patient, is informed by evidence, and makes use of all appropriate therapies. An integrative approach may include a variety of complementary and alternative medicine modalities, such as TCM (e.g., acupuncture), botanicals and supplements, mind-body medicine (e.g., hypnosis), and lifestyle modifications (e.g., sleep hygiene).² At Stanford Children's Health, in Palo Alto, CA, the current authors piloted a unique program that combines evidence-based

¹Department of Pediatrics, Boston Children's Hospital, Boston, MA.

²Division of Gastroenterology, Hepatology, and Nutrition, Department of Pediatrics, Stanford University (Stanford Children's Health), Palo Alto, CA.

integrative therapies into a systematic treatment approach for patients with refractory GERD or FD.

Traditionally, acupuncture points, such as PC 6, ST 36, and other points, have been effective for relieving symptoms, such as nausea, vomiting, and abdominal pain in both adults and children. There are no published studies to date evaluating the use of acupuncture to treat children with reflux or dyspepsia, with the exception of one literature review.²

This article describes the current authors' experience with using an IM approach, including acupuncture, to treat children with GERD and FD.

MATERIALS AND METHODS

Integrative Medicine Clinic

The Integrative Medicine Clinic at Stanford Children's Health designed a standardized approach by combining

therapies that have independently been found to benefit patients with reflux and dyspepsia (see Fig. 1). One pediatric gastroenterologist with medical acupuncture training and certification (A.M.Y.) evaluated and treated all patients. At an initial 90-minute visit, each patient received an individualized IM plan based on a conventional medical evaluation and a TCM diagnosis. Follow-up IM visits were conducted every 1–4 weeks, and included a combination of TCM, botanicals and supplements, mind–body medicine, and lifestyle modifications. Pediatric gastroenterologists within the healthcare system referred children to the IM clinic for a second opinion or after standard pharmacologic treatment failed.

Data Collection and Analysis

A retrospective chart review was performed to evaluate all children seen at the Integrative Medicine Clinic between 2013 and 2014. Children who received acupuncture and

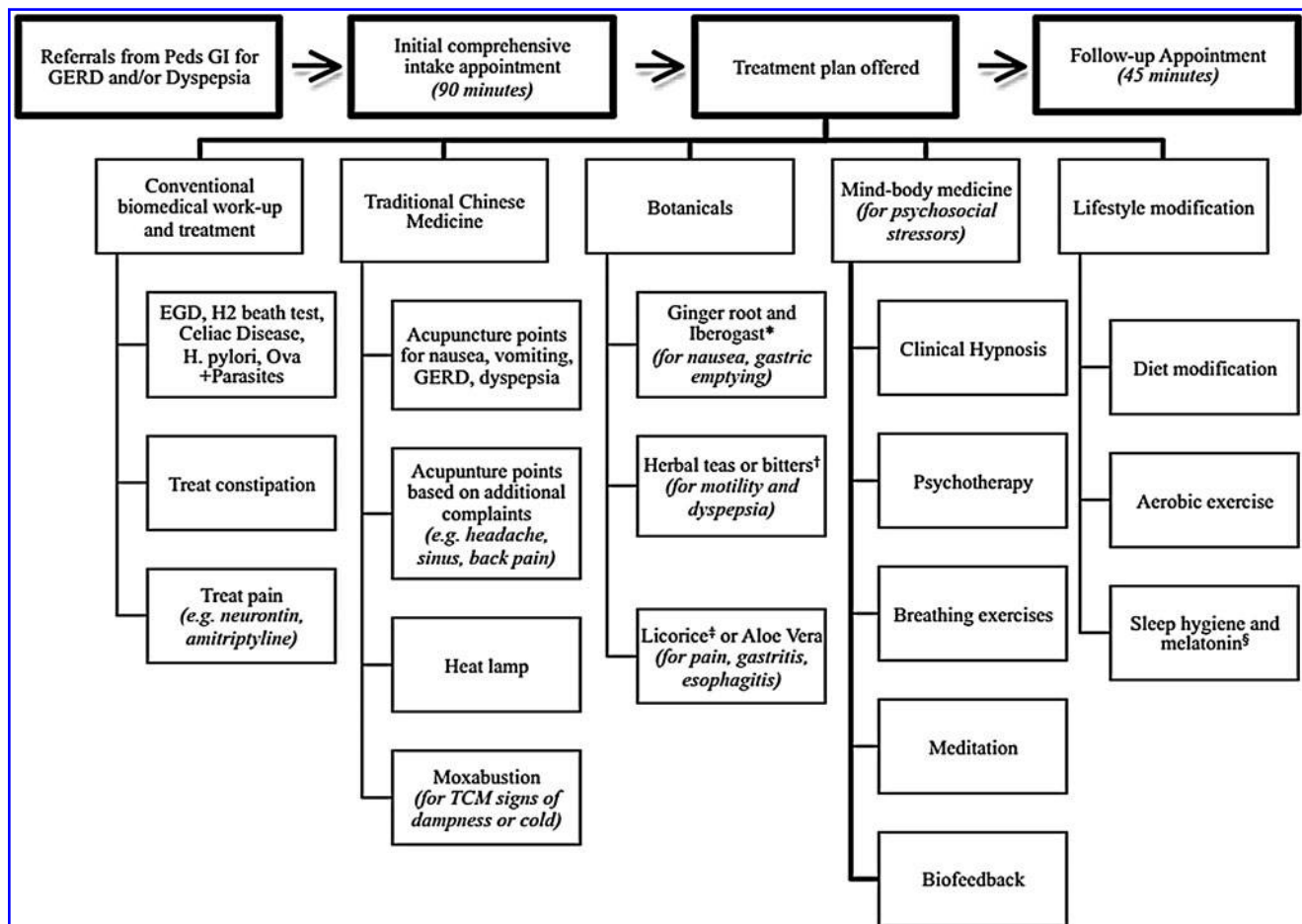


FIG. 1. Flow diagram of standardized integrative modalities for gastroesophageal reflux disease (GERD) and functional dyspepsia (FD). *Ginger pills: 250 mg daily to twice a day. Ginger (*Zingiber officinale*): candied chews as needed. Iberogast[®]: 5–20 drops in water three times per day before or with meals. †Herbal teas (ginger, chamomile [*Matricaria* spp.], lemon balm [*Melissa officinalis*], roasted dandelion root [*Taraxacum officinale*]): 30 minutes before or after meals. Herbal bitters: 1 teaspoon 30 minutes before meals. ‡Licorice (*Glycyrrhiza glabra*; deglycyrrhizinated): 400-mg tablet 30 minutes before meals, or aloe (*Aloe vera*) §Melatonin: 0.5 mg to 2 mg qHS 30 minutes before bed. Extended release preferred. PEDS GI, pediatric gastroenterology; EGD, esophagogastroduodenoscopy; TCM, Traditional Chinese Medicine.

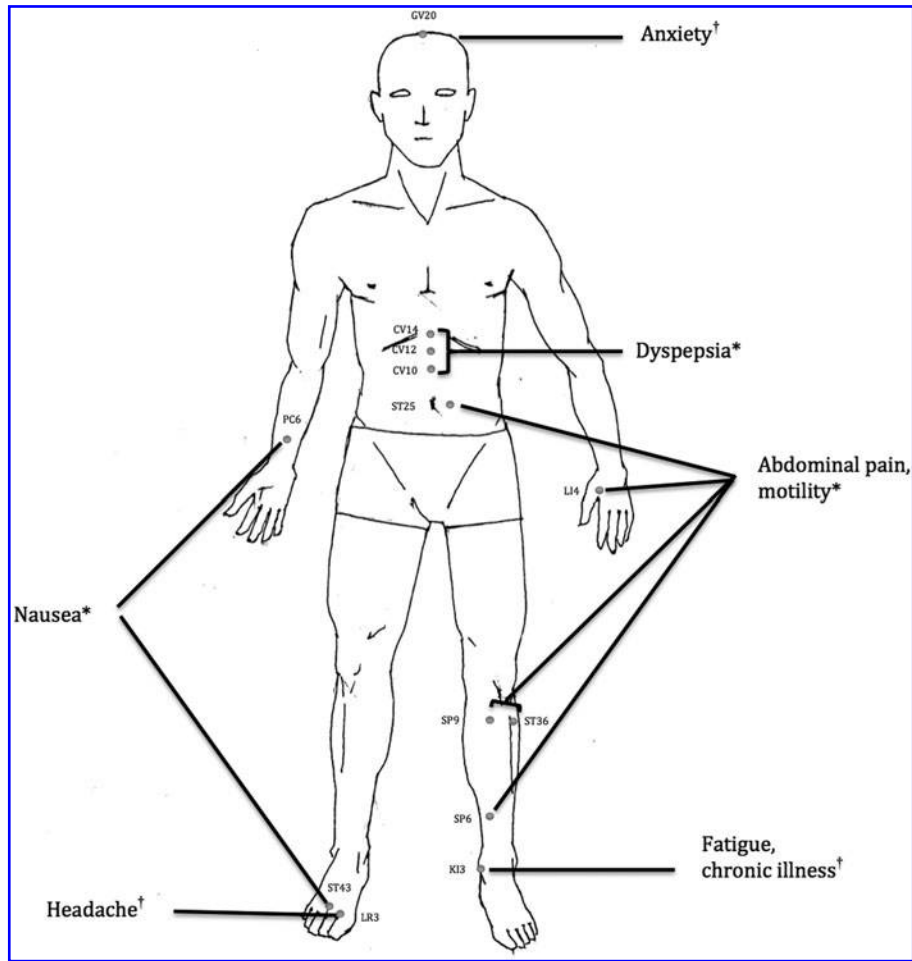


FIG. 2. Core medical acupuncture points for nausea and dyspepsia. All points are bilateral except for those in the midline. *Every patient received acupuncture or acupressure at these points. [†]Additional points added if patient presented with concurrent symptoms.

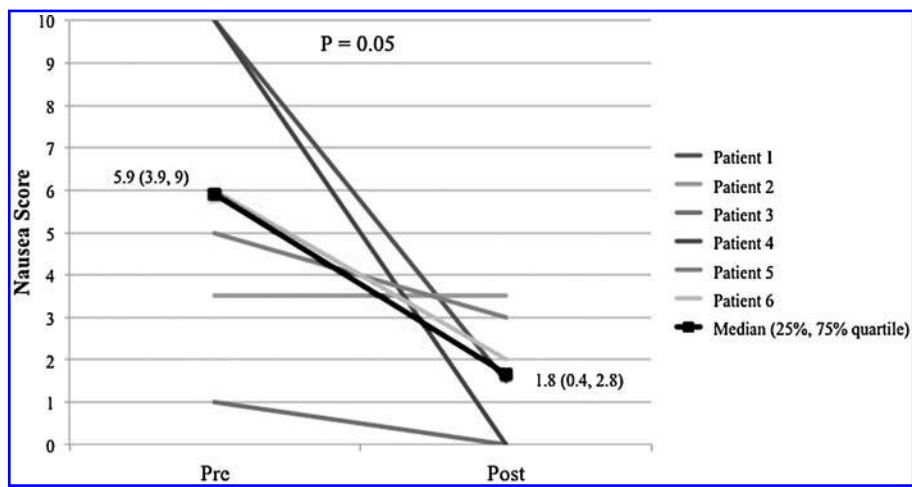


FIG. 3. Pre- and postintervention nausea scores by patient. Improvement trends in nausea were seen based pre- and postintervention scoring in 6 patients. The *P*-value reflects the result of a paired Student’s *t*-test with two tails to test the hypothesis that pre- and postintervention nausea scores were significantly different at an alpha level of 0.05.

TABLE 1. SUMMARY OF PATIENT DEMOGRAPHICS, COMORBIDITIES, WORK-UPS, PREVIOUS TREATMENTS & INTEGRATIVE MEDICINE INTERVENTIONS

Patient #	Age, gender & race/ethnicity	Comorbidities	Abnormal prior laboratory or imaging results	EGD findings	Prior biomedical treatments tried	Integrative medicine interventions
Patient 1	17 Male White/Caucasian Non-Hispanic	Constipation Asthma Vocal-cord polyps Chronic sinusitis Panic disorder without agoraphobia	None	Gross: mild furrowing in esophagus Pathology: reactive gastropathy; reflux esophagitis & 2-5/HPF eosinophils in esophagus	Diet: none Medications: cyproheptadine; lansoprazole; ondansetron; probiotics	TCM: acupuncture; body magnets; ear points; heat lamp Botanicals: ginger (<i>Zingiber officinale</i>); herbal teas; herbal bitters Mind-body medicine: hypnotherapy; psychotherapy; breathing exercises; meditation Lifestyle modification: diet; aerobic exercise; sleep hygiene; melatonin
Patient 2	11 Female White/Caucasian Non-Hispanic	Constipation Gluten-free diet for possible celiac disease	None	Gross: inflammation with ulceration in duodenum; scant chronic nonspecific erythema of stomach Pathology: duodenal mucosa portions with villous blunting; vascular ectasia; reactive changes (peptic duodenitis vs. celiac disease)	Diet: gluten-free Medications: magnesium citrate; Mylanta®; ondansetron; omeprazole; TUMS®	TCM: acupuncture; body magnets; ear points; heat lamp Botanicals: ginger; herbal teas Mind-body medicine: hypnotherapy; breathing exercises Lifestyle modification: diet; sleep hygiene; melatonin
Patient 3	17 Female Asian	None	Abnormal H2 breath test (s/p treatment with 2 courses of antibiotics)	Gross: nonspecific gastritis Pathology: negative	Diet: dairy-free Medications: esomeprazole, lansoprazole, probiotics	TCM: acupuncture; ear points; heat lamp Botanicals: herbal teas Mind-body medicine: hypnotherapy; psychotherapy; breathing exercises Lifestyle modification: diet; sleep hygiene

(continued)

TABLE 1. (CONTINUED)

Patient #	Age, gender & race/ethnicity	Comorbidities	Abnormal prior laboratory or imaging results	EGD findings	Prior biomedical treatments tried	Integrative medicine interventions
Patient 4	17 Female White/Caucasian Non-Hispanic	Anxiety Depression Migraines Seasonal allergies & rhinitis Many sinus infections TMJ pain Dysmenorrhea	None	None	Diet: avoiding self-identified triggers (e.g., caffeine, fatty foods) Medications: L-theanine; omeprazole, probiotic; promethazine	TCM: acupuncture; body magnets; ear points; moxibustion Botanicals: ginger; herbal teas; licorice (Glycyrrhiza glabra) Mind-body medicine: hypnotherapy; psychotherapy; breathing exercises; meditation Lifestyle modification: diet; sleep hygiene
Patient 5	18 Female White/Caucasian Non-Hispanic	Lactose intolerance Migraines	Upper GI/ small bowel follow-through with mild gastric fold thickening Disaccharidase with low lactase activity	Gross: mild erythema in stomach & esophagus Pathology: mild gastritis of stomach	Diet: dairy-free; avoiding self-identified triggers (e.g., fatty foods) Medications: esomeprazole; lansoprazole; ondansetron; sucralfate	TCM: acupuncture; body magnets; ear points Botanicals: herbal teas Lifestyle modification: diet; aerobic exercise; sleep hygiene
Patient 6	11 Female White/Caucasian Non-Hispanic	None	None	Gross: normal Pathology: negative biopsies	Diet: avoiding self-identified trigger (e.g., dairy food) Medications: famotidine, TUMS	TCM: acupuncture; body magnets; ear points Botanicals: ginger; herbal bitters Mind-body medicine: hypnotherapy; breathing exercises Lifestyle modification: diet; aerobic exercise; sleep hygiene; melatonin
Patient 7	17 Female Asian	Allergic rhinitis	None	Gross: mild gastritis Pathology: negative biopsies	Diet: lactose-free Medications: lansoprazole	TCM: acupuncture; body magnets; ear points; heat lamp Lifestyle modification: aerobic exercise; sleep hygiene; melatonin

TMJ, temporomandibular joint; s/p, status post; HPF, high powered field; EGD, esophago-gastro-duodenoscopy, GI, gastrointestinal; TCM, Traditional Chinese Medicine.

integrative modalities for GERD or FD were included in this study. Data on demographics, comorbidities, previous work-ups and treatments, and use of Integrative Medicine Clinic therapies were collected. Outcome variables of nausea scores (1–10), Wong-Baker FACES pain scores (1–10), and acid-blocking medication usage were recorded at each clinic visit as part of routine care. Descriptive statistics were used to assess frequencies of therapies and pre- and post-intervention changes in outcome variables. A paired Student's *t*-test with two tails was performed to test the hypothesis that pre- and postintervention nausea scores were significantly different at an alpha level of 0.05. The institutional review board at Stanford approved this study.

Intervention

Patients received acupuncture at an average interval of every 4–6 weeks. All children in the study received medical acupuncture with Seirin J needles (Weymouth, MA) of 0.16–0.20 gauge, 30-mm length, at core points bilaterally for nausea or dyspepsia as well for other symptoms on an as-needed basis (e.g., headache, fatigue). Core acupuncture points, outlined in Figure 2, included PC 6, ST 43, ST 25, CV 10, CV 12, CV 14, ST 36, SP 6, SP 9, and LI 4. The as-needed points included GV 20, LR 3, and KI 3; these points were added when indicated per a TCM evaluation. GV 20 was added to the protocol in patients with anxiety, insomnia, or agitation. LR 3 was needled and left in dispersion when there was evidence of Excess Liver Qi or Excess Fire. KI 3 was tonified if a patient had evidence of Kidney Qi Deficiency or Kidney Yin Deficiency. All points were needled bilaterally unless the point was on the midline. If a patient was acupuncture naïve, then only one or two needles were used at either ST 36 and/or LI 4 and were retained for 1–2 minutes to familiarize the patient with acupuncture.

As the patients grew accustomed to the treatments, the number of needles increased. Needles were inserted ~2 mm or until De Qi was elicited, twirled clockwise (except for LR 3, which was left in dispersion), and retained for 15 minutes. No electrical stimulation was used. Acupressure was performed with Magnetty™ body magnets. Acupressure was substituted for acupuncture if a patient did not initially tolerate the full acupuncture treatment. Patients were instructed to remove any magnets applied in the office if they did not fall off in 3 days.

Patients were also taught the locations of points CV 12, ST 43, and PC 6 and were given magnets to take home. The patients were instructed to place body magnets once per week at ST 43 and PC 6 bilaterally as needed for increased nausea, and at CV 12 as needed for increased pain or dyspepsia. The patients were instructed, after placing the magnets, to apply firm pressure for ~5 minutes to obtain symptomatic relief. A Pointer Plus Excel (Elite Healthcare, Dublin, Ireland) point finder was used to locate reactive points *Shen Men*, Liver, Spleen, Stomach, and Point Zero on

the ear. AccuPatch gold-plated beads were applied at each of these points, and patients were instructed to remove the beads if they did not fall off in 3 days.

The first-line botanicals recommended were ginger (*Zingiber officinale*) and herbal teas. In addition, herbal bitters, deglycyrrhizinated licorice (*Glycyrrhiza glabra*), and Iberogast® were recommended if symptoms continued (see dosage and frequency listed in Fig. 1).

Mind–body medicine sessions were available for all patients and included hypnotherapy, psychotherapy, breathing exercises, and/or meditation led by a certified practitioner. Lifestyle modifications consisted of eliminating trigger foods from diets, increasing physical activity, and improving sleep hygiene (with or without melatonin).

RESULTS

Patient Characteristics

Table 1 summarizes the demographics, comorbidities, and previous work-ups and treatments for the 7 children who received acupuncture. The average patient age was 15. Common comorbidities included constipation, allergic rhinitis or sinusitis, and psychiatric disorders. Four patients had normal esophagogastroduodenoscopy results or mild gastritis with negative biopsy results. Several patients had previously tried dietary modifications (e.g., a lactose-free diet). Six patients were taking histamine-2 blockers or proton pump inhibitors (PPIs) to relieve reflux symptoms; 4 patients were taking a PPI at the times of the initial clinic visits.

Individualized Therapy

On average, each patient had 8.7 clinic visits (range: 3–17 visits) over a mean duration of 167 days (range: 50–342 days). Table 1 lists all of the integrative treatment methods used for each patient. All patients received acupuncture and auricular or body acupressure. No significant adverse events occurred. One patient had self-limited erythema—which is a normal effect of acupuncture—during needling at several sites. Six patients tried botanical supplements and 5 participated in mind–body medicine sessions. All children received lifestyle counseling; 2 patients met with a registered dietitian and 4 patients were started on melatonin.

Patient-Reported Outcomes and De-Escalation of PPIs

Five of 6 patients with chronic nausea at baseline reported improvement. Figure 3 shows the downward trend between pre- and postintervention nausea scores. The differences in individual scores were not statistically significant ($P=0.05$). Lack of significance might have been partially the result of a large variance in the baseline nausea scores. However, the patients with baseline nausea scores >5 all showed marked improvement. Seventy-five percent ($n=4$) of patients who

initially had epigastric pain reported improvement. All 4 patients who were taking PPIs at the initial evaluations were weaned off over the course of treatment.

DISCUSSION

The current authors' experience, based on a retrospective analysis of a small pediatric cohort, showed that an IM approach that includes acupuncture might be effective for treating refractory GERD and FD. Although this study was limited by a small *N*, 80% and 75% of the patients reported decreases in nausea and had decreased pain scores, respectively. All of the patients were weaned off of PPI medications. While the pre- and postintervention difference in nausea scores was not statistically significant, nausea scores improved for all but 1 patient, whose score stayed the same. No significant adverse effects were reported. Patients reported having symptomatic relief immediately after acupuncture sessions while still in the clinic, and also after using botanical remedies and mind–body techniques at home. Although the generalizability of these results is premature because of the aforementioned limitations, the current authors highlight a new and underutilized therapy option for GERD and dyspepsia.

Acupuncture in children is well-tolerated, safe, and has minimal adverse effects.³ The patients in the current cohort tolerated acupuncture very well. In general, acupuncture in pediatrics requires a slightly different approach than acupuncture for adults. Fewer needles are used, and noninvasive body magnets are allowed for acupressure when patients are initially needle phobic.

The current study is the first to describe the use of a standardized integrative treatment approach for GERD and FD. All of the interventions were informed by evidence. Studies have found PC 6 and ST 36 to be effective for treating dyspepsia^{4,5} and pediatric abdominal pain.^{6,7} Furthermore, a randomized clinical trial in adults with GERD showed that adding acupuncture to PPI therapy reduced symptoms more effectively than doubling the PPI dose.⁸

Functional magnetic resonance imaging research has indicated increased attenuation of the cerebrocerebellum after acupuncture on point PC 6 more so than at control points, suggesting modulation of cerebellar activities.⁹ This suggests that the mechanism of action of PC 6 may reduce nausea through central cerebellar modulation. Given that nausea is often a significant symptom in GERD and FD, PC 6 can potentially be used to treat patients with nausea-predominant FD or GERD.

ST 36 (*Zusanli*), on the Stomach meridian, has been found in healthy men to decrease basal-acid output and gastric-acid secretion, increase pancreatic polypeptide levels, and increase the amplitude of gastric antral contractions.⁵

The botanicals and supplements recommended in the Integrative Medicine Clinic (e.g., ginger, licorice, Iberogast)

have been found to reduce reflux symptoms with few adverse effects.^{10–13} Mind–body techniques have reduced abdominal pain in children with both functional abdominal pain and irritable bowel syndrome.^{14–16} Poor sleep has been associated with exacerbated reflux symptoms on the following day,¹⁷ and melatonin has reduced GERD symptoms, compared to placebo, and has shown gastro-protective effects in small trials with adults.^{18,19} These studies suggest that the application of individual integrative therapies in pediatric gastroenterology may have significant potential for application in the future.

Because of the multiple treatment approaches, it was difficult to isolate which individual modalities were the most effective. The simultaneous use of multiple modalities simulates the healing-oriented approach used in IM and pain clinics to treat the whole person. Patients were referred to this Integrative Medicine Clinic after exhausting conventional treatments. However, the purpose of the study was not to evaluate a single intervention but to describe the effect of a holistic approach that integrated multiple therapies, including acupuncture. The authors hope that this study will inform future larger prospective comparative effectiveness studies looking at this integrative approach.

CONCLUSIONS

In this cohort of children with GERD or FD treated with a combination of acupuncture and other integrative modalities, PPI's were weaned off, and there was decrease in nausea and pain. IM may offer additional options to patients for whom standard pharmacologic treatment has failed. Prospective trials are required to study the safety, efficacy, and cost-effectiveness of acupuncture and IM for FD and GERD.

AUTHOR DISCLOSURE STATEMENT

All authors have no conflicts of interest to disclose. M.K. was funded by the Stanford University School of Medicine Medical Scholars Research Program.

REFERENCES

1. Vandenplas Y, Rudolph CD, Di Lorenzo C, et al.; NASPGHAN; ESPGHAN. Pediatric gastroesophageal reflux clinical practice guidelines: Joint recommendations of the North American Society for Pediatric Gastroenterology, Hepatology, and Nutrition (NASPGHAN) and the European Society for Pediatric Gastroenterology, Hepatology, and Nutrition (ESPGHAN). *J Pediatr Gastroenterol Nutr*. 2009;49(4):498–547.
2. Yeh AM, Golianu B. Integrative treatment of reflux and functional dyspepsia in children. *Children*. 2014;1(2):119–133.
3. Jindal V, Ge A, Mansky PJ. Safety and efficacy of acupuncture in children: A review of the evidence. *J Pediatr Hematol Oncol*. 2008;30(6):431–442.

4. Yeh CH, Chien LC, Chiang YC, Lin SW, Huang CK, Ren D. Reduction in nausea and vomiting in children undergoing cancer chemotherapy by either appropriate or sham auricular acupuncture points with standard care. *J Altern Complement Med.* 2012;18(4):334–340.
5. Takahashi T. Acupuncture for functional gastrointestinal disorders. *J Gastroenterol.* 2006;41(5):408–417.
6. Hong YR. The effects of hand-acupuncture therapy on intermittent abdominal pain in children [in Korean]. *Taehan Kanho Hakhoe Chi.* 2005;35(3):487–493.
7. Golianu B, Yeh AM, Brooks M. Acupuncture for pediatric pain. *Children.* 2014;1(2):134–148.
8. Dickman R, Schiff E, Holland A, Wright C, Sarela SR, Han B, Fass R. Clinical trial: Acupuncture vs. doubling the proton pump inhibitor dose in refractory heartburn. *Aliment Pharmacol Ther.* 2007;26(10):1333–1344.
9. Bai L, Yan H, Li L, et al. Neural specificity of acupuncture stimulation at Pericardium 6: Evidence from an fMRI study. *J Magn Reson Imaging.* 2010;31(1):71–77.
10. Khayyal MT, Seif-El-Nasr M, El-Ghazaly MA, Okpanyi SN, Kelber O, Weiser D. Mechanisms involved in the gastro-protective effect of STW 5 (Iberogast) and its components against ulcers and rebound acidity. *Phytomedicine.* 2006;13(suppl5):56–66.
11. Raveendra KR, Jayachandra, Srinivasa V, et al. An extract of *Glycyrrhiza glabra* (GutGard) alleviates symptoms of functional dyspepsia: A randomized, double-blind, placebo-controlled study. *Evid Based Complement Alternat Med.* 2012; 2012:216970.
12. Haniadka R, Saldanha E, Sunita V, Palatty PL, Fayad R, Baliga MS. A review of the gastroprotective effects of ginger (*Zingiber officinale* Roscoe). *Food Funct.* 2013;4(6):845–855.
13. Marx W, McCarthy AL, Ried K, et al. Can ginger ameliorate chemotherapy-induced nausea? Protocol of a randomized double blind, placebo-controlled trial. *BMC Complement Altern Med.* 2014;14(1):134.
14. van Tilburg MA, Chitkara DK, Palsson OS, Turner M, Blois-Martin N, Ulshen M, Whitehead WE. Audio-recorded guided imagery treatment reduces functional abdominal pain in children: A pilot study. *Pediatrics.* 2009;124(5):e890–e897.
15. Weydert JA, Shapiro DE, Acra SA, Monheim CJ, Chambers AS, Ball TM. Evaluation of guided imagery as treatment for recurrent abdominal pain in children: A randomized controlled trial. *BMC Pediatr.* 2006;6:29.
16. Vlieger AM, Menko-Frankenhuys C, Wolfkamp SCS, Tromp E, Benninga MA. Hypnotherapy for children with functional abdominal pain or irritable bowel syndrome: A randomized controlled trial. *Gastroenterology.* 2007;133(5):1430–1436.
17. Ali T, Choe J, Awab A, Wagener TL, Orr WC. Sleep, immunity and inflammation in gastrointestinal disorders. *World J Gastroenterol.* 2013;19(48):9231–9239.
18. Kandil TS, Mousa AA, El-Gendy AA, Abbas AM. The potential therapeutic effect of melatonin in gastro-esophageal reflux disease. *BMC Gastroenterol.* 2010;10:7.
19. Pereira RdeS. Regression of gastroesophageal reflux disease symptoms using dietary supplementation with melatonin, vitamins and aminoacids [sic]: Comparison with omeprazole. *J Pineal Res.* 2006;41(3):195–200.

Address correspondence to:
 Ann Ming Yeh, MD
 Pediatric Gastroenterology
 750 Welch Road, Suite 116
 Stanford, CA 94304

E-mail: annming@stanford.edu