Gastroesophageal Reflux Disease: An evaluation of the disease and treatments using traditional (allopathic) and alternative methods of care

By Kenneth L. Ring, Jr.

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Faculty Advisor: Rebecca Gould, D.C.

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ABSTRACT

METHODS: Search Pubmed, EBSCO Host, Google Scholar. Keywords: Gastroesophageal Reflux Disorder, GERD, Digestive Disorders, chiropractic, acupuncture, nutrition, diet, alternative care, natural treatment, allopathic care.

RESULTS: **S**tudies show that this condition is very managable using natural, alternative (non-allopathic) means of treatment that are longer lasting and more cost effective for the patient. The purpose of this paper is to investigate the effectiveness of conventional and alternative means of treatment.

CONCLUSION: There is no clear cut "best option" for the treatment for GERD, but there are "good" options for most patients depending on their siituation and prefernces.

INTRODUCTION

Gastroesophageal reflux disease (GERD) is a chronic digestive disease that occurs when stomach acid or, occasionally, bile flows back into the esophagus. The backwash of acid irritates the lining of the esophagus and causes signs and symptoms such as heartburn and acid reflux. Over 12.9 billion dollars are spent on antacids and proton pump inhibitors each year in attempt to correct the problem.[1] Many studies show that this condition is very managable using natural, alternative (non-allopathic) means of treatment that are longer lasting and more cost effective for the patient. The purpose of this paper is to investigate the effectiveness of conventional and alternative means of treatment.

DISCUSSION

What is GERD

Gastroesophageal reflux is a physiologic process that refers to the natural movement of gastric contents from the stomach to the esophagus. It occurs in a large portion of the population, many times every day, usually without any signs or symptoms that would indicate damage. Reflux can also be pathologic in which case signs and symptoms of damage would be present demonstrating what we know as GERD. Reflux damage to the esophagus is the most common form of GERD and is most often recognized by recurring heartburn. In almost all patients with heartburn, some sort esophageal lining pathology is evident, however only about 40% have detectable erosions when observed by endoscopy. The remaining 60% of patients with heartburn have undetectable pathology whereas the epithelial lining of the esophagus is not damaged—referred to as *nonerosive reflux disease* or "NERD." The only reliable way to differentiate between GERD

and NERD is to visualize the esophageal epithelial lining by perfoming an endoscopy. In addition to GERD, and the non-erosive form, NERD, there are many other disease processes that are associated with gastroesophageal reflux disease that have varying symptomotology and severity.[2]

The Anatomy and how its involved

Esophagus

The esophagus is a muscular tubular organ that connects and allows food to pass from the pharynx to the stomach. In GERD patients, reflux of stomach contents occurs causing irritation to the esophageal epithelial lining.[3] Chronic recurrence of this malfunction not only causes GERD but can lead to a host of other issues including esophagitis, esophageal uleration, esophageal stricture, and in worst case situations Barrett's esophagus which is a pre-malignant condition associated with adenocarcinoma.[2, 4]

Lower Esophageal Sphincter

The lower esophageal sphincter or "LES" is a ring of smooth muscle at the junction of the exophagus and the stomach which normally remains constricted to prevent reflux of gastric contents except when swollowing to allow food to pass from the esophagus to the stomach. The Merck Manual states that lower esophageal sphincter (LES) incompetence is indicated by the presence of reflux. This weakening is said to be caused from repeated relaxations which are triggered by gastric over filling and stretching or excess phayrngeal stimulation.[5] LES sphincter tone has also been found to be decreased in smokers, the obese and even patients who have asthma.[6]

Stomach

The stomach is a hollow organ where food is broken down and temporarily stored. When food enters the stomach it is mixed with stomach acid and enzymes to break the food down into smaller pieces. This combination of digested food parts and stomach juices is called chyme. The stomach also stores food temporarily, releasing chyme in small amounts into the small intestine, where it is further broken down into nutrients to be absorbed into the body.

When the fundus portion of the stomach is stretched by filling of ingested food or release of gases during digestion, the LES experiences reflex relaxations. This pattern of over-relaxation is associated with acid reflux because the relaxation period is twice as long as relaxations experienced with swallowing.[2]

Two basic causes of GERD

1. *Reflux of stomach acid causes prolonged contact with esophagus.*
2. *Weakened esophageal lining is irritated even with normal contact of stomach acid.*

GERD develops when acidic gastric contents back up into the esophagus and remain there long enough to overwhelm the barrier of the esophageal lining. Based on 24-hour esophageal pH monitoring, GERD develops when there is prolonged contact of the esophageal epithelium with refluxed gastric acid or when the esophageal epithelial lining is damaged despite under a normal period of contact with refluxed gastric acid. Prolonged acid contact frequently results from lower esophageal sphincter (LES) relaxations. These unnecessary relaxations make up more than 50% of acid reflux events in NERD. These relaxations are reflex relaxations of the lower esophageal sphincter caused by stretching of the fundus portion of the stomach. This pattern of over-relaxation is associated with acid reflux because the relaxation period is twice as long as

relaxations with swallowing and is also categorized by inhibition of diaphragmatic contraction and an absence esophageal peristalsis. In GERD, most complications occur across a mechanically weak lower esophageal sphincter. Patients with heartburn despite normal acid contact time most likely have defects in tissue resistance probably brought on by poor dietary choices.[2]

Other causes of GERD

Overeating

By the time a person feels "stuffed", or even just "really full"most likely they've had more to eat than their stomach should hold causing excess stretch in the stomach tissue. Along with the digestive processes, many times gas and bloating are experienced as well. This overfilling of the stomach along with increased pressure caused by gasses released during digestion overwhelms the mechanical ability of the Lower esophageal sphincter and allows stomach contents to reflux into the esophagus.

Medications, caffeine, alcohol, smoking

Caffeine, alcohol and smoking can all trigger acid reflux. Smoking specifically releases chemicals in the cigarette smoke that reduce the function and tone of the LES.[4] The weakened muscle then allows acid to travel up the esophagus causing irritation.

Eating habits and routines

In some cases patients with an already weakened LES, that otherwise would not cause any problems, may create them with their eating habits and routines after eating. According to the International Foundation for Functional Gastrointestinal Disorders (IFFGD), patients with a

weakened LES have an increased liklihood of developing heart burn, acid reflux and GERD if they eat their meals too close to bed time because the musculature relaxes with sleep. This deminished capability of the LES during sleep in combination with an already weakened LES greatly increases the probability of reflux and the occurance of GERD. The IFFGD recommends eating at least 3 hours prior to laying down so that the body has time to digest the food that was eaten and so that the acid levels in the stomach have a chance to subside. Disregarding this instruction and laying soon after eating puts the body at a disadvantage because gravity is no longer helping the food to travel downward through the digestive tract. Without gravity keeping stomach contents down, laying down after eating also makes it much easier for reflux to occur into the exophagus causing irritation which could lead to GERD.[7]

Obesity

Obesity has been associated with incrased intra-abdominal pressures, impaired gastric emptying, decreased lower esophageal sphincter tone, and increased frequency of sphincter relaxation, thus leading to increased esophageal acid exposure. This increased exposure causes irritation of the esophagus and can lead to GERD or other disease processes.[4, 8]

Stress

The stress response of the body is complicated, but predictable. When stress is placed on the body, whether mental, chemical, or physical, it triggers a specific cascade of events to occur. Simply put, stress causes an overwhelming sympathetic response and when is experienced chronically, can affect visceral function, contributing to GERD.[9]

Symptomotology and Signs of GERD

Symptoms

Recurrent heartburn, is the hallmark of GERD and is the most common symptom reported by GERD sufferers. Reflux, regurgitation and non-cardiac chest pain are also common symptoms almost always associated with GERD.[10] This conglomeration of symptoms is often seen as enough to enable the diagnosis to be made by the history alone. The heartburn associated with GERD typically occurs once or twice per day and lasts from a few minutes to an hour or more if untreated. This pattern recurs, but with considerable variation in frequency and severity. However, the frequency, severity, or duration of heartburn cannot predict the disease severity that can be seen with endoscopy. GERD can also be associated with dysphagia, an *alarm symptom* because it raises concern for the presence of a peptic stricture or adenocarcinoma arising in Barrett's esophagus. For this reason, dysphagia is an indication for early endoscopy.[2] Many patients who experience frequent symptoms are also to have similar, or sometimes more severe symptoms after retiring to bed. Patients who experience nocturnal symptoms with GERD also report a significantly impaired health related quality of life.[11]

Signs

The damage caused by GERD is best assessed by upper endoscopy and esophageal biopsy. Endoscopy may reveal friability, erosions, ulcers, strictures, or Barrett's esophagus in a third of subjects. In the other two thirds, endoscopic findings are normal but esophageal biopsy may show basal cell hyperplasia, elongation of the rete pegs, inflammatory cell infiltrates, cell edema, dilated intercellular spaces in squamous epithelium, or any combination of these findings. Dilated intercellular spaces is the earliest detectable lesion in NERD and is associated with heartburn because it reflects “leakiness” of the paracellular pathway to refluxed gastric acid. A

barium swallow or upper gastrointestinal series may also detect ulcers, strictures, and hiatal hernias, but it does not dependably detect inflammation, erosions, or Barrett's esophagus.[2]

Who gets GERD?

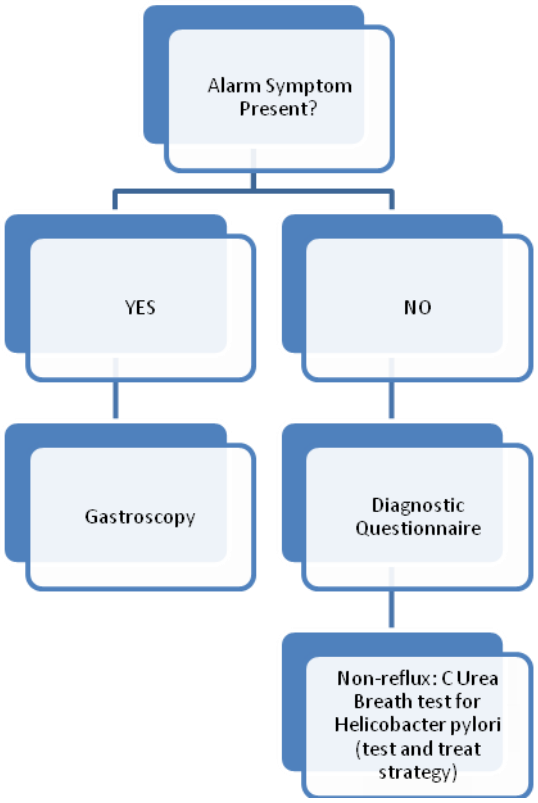
GERD is a disease that can affect anyone at any point during their lives, however, GERD is more common among some groups of people. According to the National Institute of diabetes and Digestive and Kidney Disease (NIDDK) a division of the National Institutes of Health (NIH), the liklihood of developing GERD increases among those who are obese, pregnant or are smokers.[12, 13] It is believed that obesity and pregnancy both increase the occurance of GERD by putting more pressure on the stomach, inturn causing laxity of the LES. GERD is also found more commonly in patients over the age of 40, with peak incidence between the ages of 45 and 60 according to the National Digestive Disease Information Clearinghouse (NDDIC), a publication reviewed by the NIDDK.[13]

Diagnosing GERD

A diagnosis of GERD should be made by a medical physician. The disease can usually be diagnosed based on the presentation of symptoms alone.[7] Diagnostic testing such as upper endoscopy or a barium swallow radiograph can be used to confirm the diagnosis and differentiate from NERD.

Conglomeration of Symptoms

One study gives a flow chart (see below) for assessing the patient's symptoms and need for further testing to diagnose GERD. This chart gives the physician a standardized means of testing for potential GERD.[14]



Barium swallow radiograph

This examination uses x rays to help detect abnormal changes such as a hiatal hernia and severe inflammation of the esophagus. The examining doctor will conduct x-rays after the patient drinks a barium contrast solution. Mild irritation will not appear on this test, although narrowing of the esophagus--called stricture--ulcers, hiatal hernia, and other problems will. Although this test is not the best option for diagnosing GERD, it is helpful in determining further complications associated with the disease.[7]

Upper endoscopy

This procedure is performed in a hospital or a doctor's office. A thin, flexible plastic tube with a tiny camera, called an endoscope allows the doctor to see the surface of the esophagus and to search for abnormalities. Moderate to severe symptoms and/or evidence of injury to the esophagus, usually requires no further tests to confirm GERD. In a patient with "GERD symptoms" but no evidence of erosion may be diagnosed with NERD or recommended for further testing to look for early signs of the disease at the cellular level.[10]

Ambulatory pH monitoring examination

In an ambulatory pH monitoring examination, a tiny tube is inserted into the esophagus that will stay there to examine pH levels for 24 hours. Any acid that refluxes into the patient's esophagus is qualified by the tube and the information is recorded. This test is useful in patients who experience GERD symptoms but have no evidence of esophageal damage. The procedure is also helpful in detecting whether respiratory symptoms, including wheezing and coughing, are triggered by reflux and also in determining the likelihood of treatment success.[10, 15]

Conventional Treatment Options

Conventional medical care for GERD is well accepted by the medical community. Care for GERD patients by medical doctors is principally the same and is generally congruent with the recommendations made by the IFFGD.[16]

Lifestyle Changes: Altering daily routines and doing away with bad habits are almost always part of the recommended care made by any physician, medical or otherwise. These recommendations have been shown to be very effective in some patients while not displaying much change in others.[17]

- If you smoke, stop.[4, 7, 18]
- Alcohol/food avoidance (fatty foods, caffeine, coffee, chocolate, etc)[4, 7, 18]
- Elimination of dairy in children[19]
- Elimination of carbonated beverages[7], although debated by some medical professionals[20]
- Maintain optimal weight[8]
- Eat small meals[7]
- Avoid tight fitting/constricting clothing[7]
- Avoid lying down for 3 hours after a meal.[7]
- Raise the head of your bed 6 to 8 inches by putting blocks of wood under the bedposts--only using extra pillows will not help[18]

Medications: Medical doctors may recommend over-the-counter antacids, which can be bought without a prescription, or prescription medications (H_2 blockers and proton pump inhibitors) that stop acid production or help the muscles that empty the stomach function better.

- Antacids, such as Mylanta and Tums are usually the first drugs recommended to relieve heartburn and other *mild* GERD symptoms since they are available without prescription and at a lower cost to the patient than prescription alternatives.
- H2 blockers, such as Tagamet HB (cimetidine), Pepcid AC (famotidine), Axid AR (nizatidine), and Zantac 75 (ranitidine), hamper acid production. They are offered in prescription strength and over the counter. They are effective for about half of those who have GERD symptoms.
- Proton pump inhibitors include Prilosec (omeprazole), Prevacid (lansoprazole), Protonix (pantoprazole), Aciphex (rabeprazole), and Nexium (esomeprazole), which are all

available by prescription. Proton pump inhibitors are more effective than H_2 blockers and have been shown to relieve symptoms in most people who have GERD.

Even within the realm of medications there are "alternatives" to conventional treatment. For example a study by Farup et al. looked at conventionally accepted treatment versus a chewable on-demand form of the medication. In this particular study, patients much preferred the on demand chewable over the regular treatment.[21]

Alternative Treatment Options

40% of parents of pediatric gastroenterology patients are turning to complimentary and alternative medicine for their child. Lack of effectiveness of convetional therapy, school absenteeism, and adverse effects of allopathic medication are more important predictors of complementary and alternative medicine use than the type of gastrointestinal disease. About 36% of children who are attending gastroenterology outpatient clinics were using complementary and alternative medicine. Complementary and alternative medicine includes chiropractic, accupuncture, dietary changes, herbal remedies and anything else that falls outside the common course of care accepted and recommended by the allopathic model.[12]

When using CAM, most of these modalities are aimed not only at relieving symptoms, but also "at helping the individual in a process of self –healing within a holistic view of health, in which body, mind, and spirit are addressed."[12]

Chiropractic: Chiropractic is a hollistic form of healthcare that looks at the structure of the body for the cause of disease. Chiropractic acknowledges that the nervous system plays a vital role in the body's ability to function properly and to heal itself. When there is misalignment of vertebra

in the spine, the result in less than optimal transmission of nerve impulses between the brain, which is the body's control center, and any corresponding organ, tissue, and cell. Correction of these misalignments removes that interferance from the nervous system and restores proper transmission of nerve impulses between the brain and the rest of the body allowing it to function as it was designed to do so.

Dr. Loomis has researched and writes of the connection between spinal alignment and visceral function.[22] Specifically addressing hydrochloric acid levels in the stomach, he states, ". . .Patients presenting with Pottenger's saucer have digestive symptoms associated with deficient hydrochloric acid production (not excess production), biliary stasis, gas and bloating, and perhaps suffer from the symptoms of hypoglycemia. Low glucose levels always trigger a sympathetic cascade of physiological events that are quite predictable and easy to find with a palpatory examination." ". . . Most acute attacks of heartburn or gastritis can be relieved immediately with an anterior dorsal adjustment and the appropriate upper cervical adjustment."[23]

Melatonin is a hormone released by the pineal gland and helps to regulate other hormones and maintain the body's circadian rhythm.

In an article by Werbach, melatonin levels are studied, finding that melatonin levels during sleep are significantly reduced in patients with GERD. He writes, "Melatonin has been shown to protect against GI ulcerations by several actions. It is a potent antioxidant, it inhibits the secretion of hydrochloric acid and pepsin, and it stimulates the immune system. These actions increase microcirculation and promote regeneration of the luminal epithelium."[24] Making this link between melatonin levels and GERD we can deduce that supplementing melatonin may help to protect the esophagus from the harmful effects of GERD, restore damage that has already been

done, or perhaps even prevent it from occuring.

Herbal Medicine and Enzyme Nutrition. Herbal Medicine, also known as phytotherapy is the use of plant and root extracts and other similarly natural substances for medicinal purposes. Using herbs to illicit a desired medicinal effect has been practiced for centuries and is known to be very effective for treating many conditions.

Dr. Loomis has researched and writes of the positive effect herbs have on the digestive system. "Nourishing the mucous membranes of the digestive tract can be done by using herbal mucilages and enzymes. Mucilages are herbs that have properties to soothe inflamed tissues . . . Unlike antacids, these mucilages do not control abnormal gastric secretions of HCL by turning off all digestion in the stomach, putting the entire stress of digestion on the pancreas." Dr. Loomis has also done extensive research on the use of enzymes and describes the use of enzymes in conjunction with herbs to "relieve the body of some of its digestive burden," allowing for optimal digestion and absorbtion of the herbs to take place, therefore providing maximum therapeutic value to the affected tissues.[25]

Accupuncture is a form of CAM which uses the concepts of Traditional Chinese Medicine and the concept of energy flow within the body know as "qi." Acupuncture uses thin, flexible needles and very specific placement in recognized acupuncture points which are connected by channels called, "meridians." Proper placement and manipulation of these needles is very important to achieve the desired anatomical stimulation which is the means in which acupuncture corrects imbalances in the body's qi.

A study done by Ouyang and Chen found that using auricular acupoints reduces resting LES pressure, therefore improving esophageal peristalsis and LES relaxation. This study also notes another conducted by Chang et al. which found that manual acupuncture improved LES relaxation by 11.3% and increased the peristaltic contractions by 4.3% during swallowing.[26] The physilogical changes illicited by performing acupuncture make clear the efficacy of this particular area of CAM and in many cases has proved to be more effective than conventional treatment.[27]

Nutrition/Diet: In addition to the typical recommendations made by medical practitioners, CAM offers other advice on nutrition and diet to include pre and probiotics, anti-inflammatory foods and weight loss. Before making recommendations, the diet must be assessed and deficiency if present must be identified.

Probiotics and Prebiotics: Probiotics as defined by the World Health Organization (WHO) are "Live microorganisms which when administered in adequate amounts confer a health benefit on the host."[28] A prebiotic has been defined as a non-digestible food ingredient which benefically affects the host by selectively stimulating the growth of and/or activating the metabolism of health-promting bacteria in the intestinal tract. Pre and probiotics have proven very beneficial in digestive health, not only in the gut, but the entire digestive tract. According to research done by Vlieger et al. These microorganisms have many roles to perform to include, fermentation, vitamin synthesis, energy production, epithelial cell differentiation, immunomodulation, and protecting against pathogens. Recognizing the function of these organisms makes the link

between the imbalance of the gut flora and disease outside the gut clear, and therefore also demonstrates the importance of supplementation if necessary.[3]

Anti-inflammatory foods are foods that help naturally reduce inflammation in the body. GERD is commonly exacerbated by eating certain foods and by the same means, certain foods can help prevent or reduce the occurance of GERD-causing reflux. Anti-inflammatory foods help to reduce inflammation systemically. In the same fashion, it is also just as important to avoid "inflammatory foods" that promote systemic inflammation.[18]

Atkins Low-Carbohydrate diet was initiated in a case study to measure its effectiveness in improving GERD symptoms. The study concluded that weight loss, reduction of caffeine intake and reduction of carb intake all relieved the GERD symptoms. In this particular study, two of the individuals began introducing high carb foods into their diet once again their GERD symptoms returned. The individuals in these case reports experienced complete and nearly immediate resolution of GERD symptoms after reinitiating a low-carbohydrate diet."[18]

Weight Loss: Losing excess weight is very iportant for the GERD patient. Losing weight helps to decrease intra-abdominal pressures, increase gastric emptying and lower esophageal sphincter tone, and decrease frequency of transient sphincter relaxation. Of the 9 studies reported by Hampel, 6 studies showed a statistically significant association between obesity and GERD, and 3 studies showed no association."[8]

CONCLUSION

There are many treatment options when it comes to dealing with GERD patients and the symptoms they experience. Medical doctors offer a variety of options for treating GERD as do

those who practice CAM. As research shows that most of the methods of care evaluated provide relief for the patient, the "best" treatment may very well come down to the preferance of the one suffering from the disorder. As the research shows, at least for children, parents are opting for something more "natural" when it comes to caring for GERD or minimally, are searching for alternative options to traditional care. Positively for those searching for alternatives to traditional medical care for GERD, CAM options seem to be just as effective . . . which could also be viewed just as positively for those preferring allopathic treatment. There is no clear cut "best option" for the treatment for GERD, but there are "good" options for most patients depending on their siituation and prefernces.

References

1. Loomis, H. F. (2004, November). Natural healing: gastroesophageal reflux disease. *The Chiropractic Journal.*
2. Macdonald, G. (2008), Cecil Medicine, 23rd edition -.by W. P. Arend, J. O. Armitage, D. R. Clemmons, J. M. Drazen, R. C. Griggs and N. Larusso.
3. Hanaway, P. (2006, September). Balance of flora, GALT, and mucosal integrity. *Alternative Therapies*, *12*(5).
4. Pluta, R. (2011, May 18). JAMA patient page: Gastroesophageal reflux disease. *The Journal of the American Medical Association*, *305*(19).
5. Loomis, H. F. (2010, June). Subluxation: Cause or effect? Visceral connections from the sympathetic cervical ganglion - Part II. *The Chiropractic Journal*.
6. Crowell, M., Zayat, E., Lacy, B., Duncan, A., & Liu, M. (2001). The effects of an inhaled B2-adrenergic agonist on lower esophageal function: a dose-response study. *Chest*.
7. International Foundation for Functional Gastrointestinal Disorders. (2009, October 28). In *IFFGD.org*. Retrieved November, 2011, from www.aboutgerd.org
8. Hampel, H., Abraham, N., & El-Serag, H. (2005, August 2). Meta-Analysis: Obesity and the risk for gastroesophageal reflux disease and its complications. *Annals of Internal Medicine*, *143*(3).
9. Hardy, K., & Pollard, H. (2006, October 18). The organisation of the stress response, and its relevance to chiropractors: a commentary. *Chiropractic & Osteopathy*, *14*(25).
10. Ang, D., Sifrim, D., & Tack, J. (2008, July). Mechanisms of Hertburn. *Gastroenterology and Hepatology*, *5*(7).
11. Farum, C., Kleinman, L., Sloan, S., Ganoczy, D., Che, E., Lee, C., & Revicki, D. (2001, January 8). The impact of nocturnal symptoms associated with gastroesophageal reflux disease on health-related quality of life. *Arch Internal Medicine, 161*.
12. Vlieger, A., Blink, M., Tromp, E., & Benninga, M. (2008, July 28). Use of complementary and alternative medicine by pediatric patients with functional an organic gastrointestinal diseases: Results from a multicenter survey. *Pediatrics*.
13. Heartburn, Gastroesophageal Reflux (GER), and Gastroesophageal Reflux Disease (GERD). (2007, May). In *National Institute of Diabetes and Digestive and Kidney Diseases*. Retrieved October, 2011, from http://digestive.niddk.nih.gov
14. Horowitz, N., Moshkowitz, M., Leshno, M., Ribak, J., Birkenfeld, S., Kenet, G., & halpern, Z. (2007, July). Clinical trial: evaluation of a clinical decision - support model for upper abdominal complaints in primary- care practice. *Journal Compilation*.
15. Kushnir, V., Sayuk, G., & Gyawali, C. (2010, May). Abnormal GERD parameters on ambulatory pH monitoring predict therapeutic success in noncardiac chest pain. *American Journal of Gastroenterology*, *105*(5).
16. Knutsson, K., Ohlson, B., & Troein, M. (2005, May 15). Clinicians' management strategies for patients with dyspepsia: a qualitative approach. *BMC Gastroenterology*, *5*(15).

17. Reflux or gerd: When heartburn spells trouble. (2011, April). In *National Institutes for Health (NIH)*. Retrieved September, 2011, from http://newsinhealth.nih.gov/issue/apr2011/Feature2
18. Yancy, Jr., W. S., Provenzale, D., & Westman, E. C. (2001, November). Improvement of gastroesophageal reflux disease after initiation of a low-carbohydrate diet. *Alternative Therapies, 7*(6).
19. Farahmand, F., Najafi, M., Ataee, P., Modarresi, V., Shahraki, T., & Rezaei, N. (2011, September). Cow's milk allergy among children with Gastroesophageal Reflux Disease. *Gut and Liver, 5*(3).
20. Johnson, T., Gerson, L., Hershcovici, T., Stave, C., & Fass, R. (2010). Systematic review: the effects of carbonated beverages on gastro-oesophageal reflux disease. *Alimentary Pharmacology & Therapeutics, 31*.
21. Farup, P., Heibert, M., & Hoeg, V. (2009). Alternative vs. conventional treatment given on-demand for gastroesophageal reflux disease: a randomized controlled trial. *BMC Complementary and Alternative Medicine, 9*(3).
22. Loomis, H. F. (2010, February). Subluxation: Cause or effect. Middle cervical subluxations and the diaphragm. *The Chiropractic Journal*.
23. Loomis, H. F. (2007, April). The 2nd factor in chiropractic: Pottenger's Saucer and GERD. *The Chiropractic Journal*.
24. Werbach, M. (2008, July). Melatonin for the treatment of gastroesophageal reflux disease. *Alternative Therapies, 14*(4).
25. Loomis, H. F. (1999, November). Subluxation-based nutrition: The mucous lining of the digestive tract. *The Chiropractic Journal*.
26. Ouyang, H., & Chen, J. (2004). Review article: therapeutic roles of acupuncture in functional gastrointestinal disorders. *Alimentary Pharmacology and Therapeutics, 20*.
27. Schneider, A., Streitberger, K., & Joos, S. (2007, July 7). Acupuncture treatment in gastrointestinal diseases: A systematic review. *World Journal of Gastroenterology, 13*(25).
28. Guidelines for the Evaluation of Probiotics in Food. (2002, May). In *World Health Organization*. Retrieved October 29, 2011, from http://www.who.int/foodsafety/fs_management/en/probiotic_guidelines