Journal of Medical Diagnostic Methods
ISSN: 2168-9784

Randall et al., J Med Diagn Meth 2014, 3:1
DOI: 10.4172/2168-9784.1000152

Mini Review Open Access

Utilizing Electrogastrography in the Evaluation of Idiopathic Dyspepsia

Charles W Randall[1], Jonathan Zaga-Galante[2]*, Adriana Vergara-Suarez[3] and Carlo M Taboada[4]

[1]*Clinical Professor of Medicine, University of Texas Health Science Ctr, San Antonio CEO, Gastroenterology Research of America, USA*
[2]*American Society of Clinical Oncology member, American College of Physicians member, Anahuac University Mexico City, Mexico*
[3]*American Society of Clinical Oncology member, Anahuac University Mexico City, Mexico*
[4]*Gastroenterology Research of America, USA*

Introduction

Dyspepsia is a common symptom presenting to clinicians. Approximately two-thirds of these patients have no discernible organic cause while the remaining third have a cause that once eliminated results in resolution of symptoms. The Rome III committee has suggested that the term non-ulcer dyspepsia no longer be used for patients without an organic etiology. The preferred term is idiopathic dyspepsia [1]. Symptom complexes can be classic, ulcer-like dyspepsia, dysmotility- like (early satiety, nausea, and post-prandial discomfort), or undifferentiated. Research has shown that gastric arrhythmias are responsible for many cases of idiopathic dyspepsia. This paper reviews the basics of electrogastrography and the management of dysrhythmias.

Background

Though electrogastrography has slowly gained acceptance over the past 2-3 decades its use was primarily limited to centers interested in motility and neurogastroenterology until recently. The first recorded Electrogastrogram (EGG) was performed in the lab of Walter Alvarez at the University of California, San Francisco in 1921 [2]. Another early pioneer of the 1920s and 1930s was I. Harrison Tumpeer [3,4]. Perhaps the father of the modern EGG was RC Davis whom demonstrated changes in the gastric rhythm from the fasting to the fed state [5]. For the past 30 years Kenneth Koch and Robert Stern have modernized electrogastrography into the technique used today. Their works have shown the different motility patterns associated with disorders such as motion sickness, dysmotility-like dyspepsia, pregnancy, diabetes, functional dyspepsia, and chronic nausea syndromes [6-10].

Technical Aspects of the EGG

The EGG measures gastric myoelectrical activity through application of cutaneous electrodes [11]. The technique to record an EGG must be performed with meticulous care since the signal produced by the slow waves in the stomach is tenuous and easily disturbed by movement or noise. It is advised to have a quiet room dedicated to electrogastrography. The study is performed in 3 stages: preprandial, prandial, and post-prandial. The slow wave activity is measured during each phase for accurate recording of gastric motility. It is important to maintain the patient drug free (including antibiotics) for at least one week before the procedure is taken place, even a placebo can affect the gastric motility, if there are drugs that cannot be suspended by the patient, the physician must investigate their effect on gastric motility.

Classification of gastric dysrhythmias is dependent upon an understanding of gastric myoelectrical activity. From this knowledge one can categorize dysrhythmias into tachygastria, bradygastria, or mixed. The normal frequency of gastric slow waves ranges from 2.5-3.75Cycles Per Minute (CPM) with an average of 3 CPM [12]. This frequency allows the propagation of slow waves that originate in the Interstitial Cells of Cajal (ICC) that are found in greatest numbers along the greater curvature. The role of the ICC is maintenance of normal myoelectrical activity [13]. In essence, the ICC are the stomach's pacemakers and when they are damaged, reduced in number, or influenced by external factors dysmotility may occur. Hyperglycemia, vagal stimulation, pregnancy, motion, medications, anxiety, and chronic depressive disorders can affect the function of the ICC [14].

Changes in the slow wave frequency result in motility disturbances. Bradygastria is defined as low frequency gastrograms that range from 0.5 to 2.5 CPM. Tachygastria alternatively show frequencies in the ranges of 4.0 to 10 CPM. With mixed dysrhythmias features of both bradygatria and tachygastria are observed. It is worth to emphasize that the clinical manifestations of these abnormal rhythms are going to be very similar, in both cases the patient will present with symptoms of delay gastric emptying such as nausea, vomiting, early satiety, bloating among others; therefore the diagnosis is challenging for the physician, if miss diagnose, the treatment for the opposite rhythm will increase the symptoms.

Clinical Applications

Research in recent years has taken electrogastrography from the neurophysiology lab to clinical investigations. Much like cardiologists specializing in electrophysiology, gastroenterologists are using pharmacotherapies to stabilize gastric dysrhythmias and resolve the associated symptoms.

The standard approach to patients with unexplained dyspepsia following necessary imaging studies, labs that include tests for endocrinopathies, and endoscopy has been empirical treatments that usually are unsuccessful and leave both patient and physician dissatisfied. Many clinicians request nuclear gastric emptying studies but unfortunately delayed gastric emptying may be seen in equal frequency in both tachygastria and bradygastria. Likewise a normal emptying study does not exclude a gastric dysrhythmia [15,16]. A pilot study showed that nearly 60% of these patients have an underlying dysrhythmia [17] but recently a 12 year follow-up study observed a gastric motility disorder in nearly 78% of patients with unexplained or idiopathic dyspepsia [18]. Interestingly patients whom present with symptoms consistent with gastroparesis have tachygastria with the same frequency as do patients with more classic dyspeptic symptoms [19].

Once a dysrhythmia is diagnosed, modulating the enteric nervous

***Corresponding author:** Jonathan Zaga-Galante, American Society of Clinical Oncology member, American College of Physicians member, Anahuac University Mexico City, Tel: (210) 410 2515; E-mail: jonathanzaga@gmail.com

Received January 06, 2014; **Accepted** February 10, 2014; **Published** February 12, 2014

Citation: Randall CW, Zaga-Galante J, Vergara-Suarez A, Taboada CM (2014) Utilizing Electrogastrography in the Evaluation of Idiopathic Dyspepsia. J Med Diagn Meth 3: 152. doi: 10.4172/2168-9784.1000152

system can improve a patient's quality of life [20]. An overall benefit of nearly 90% has been seen with an average observational time of over 7 years. 38% had complete resolution of their problem. Tachygastria is the most common of the dysrhythmias, and tricyclics, especially desipramine, have shown efficacy in reducing or eliminating symptoms. 10mg given each evening is a widely acceptable starting dose with incremental increases every few days to weeks until maximum benefit is achieved. Seldom are doses greater than 50 mg required. Forbradygastria, prokinetics such as metoclopramide, domperidone, cisapride, and tegaserod have been effective treatments. Because of CNS disturbances metoclopramide is not advisable and cisapride and tegaserod are unavailable in the USA. Most compounding pharmacies can provide domperidone, and a starting dose of 10 mg 3-4 times daily before meals is recommended. Mixed dysrhythmias have been less studied. In choosing a therapy, the predominant motility pattern is usually the one addressed. For example if tachygastria is most prevalent then a tricyclic is recommended, while a prokinetic is chosen when bradygastria is the primary rhythm disturbance.

Summary

Dyspepsia is a common complaint that patients bring to their physician. Following evaluation with endoscopy, lab, and imaging studies the majority of patients do not have an organic cause. Though nuclear studies are reliable in determining delayed gastric emptying they cannot assess myoelectrical activity and contractility [21]. Use of the EGG provides a rapid diagnosis thus giving a patient a sense of security. Tailoring pharmacotherapies to the underlying dysrhythmia improves quality of life.

References

1. Tack J, Talley NJ, Camilleri M, Holtmann G, Hu P, et al. (2006) Functional Gastroduodenal Disorders. The Functional Gastrointestinal Disorders 130: 419-486.
2. Alvarez W (1922) New methods of studying gastric peristalsis. JAMA; 22: 1281-1284.
3. Tumpeer, IH, Blitzen, PW (1926) Registration of peristalsis by the Einthoven galvanometer. Am J Dis Child 21: 454-455.
4. Tumpeer, IH, Phillips, B (1932) Hyperperistaltic electrographic effects. Am J Med Sci 184: 832-836.
5. Davis RC (1959) Conditions associated with gastrointestinal activity. J Compar Physiol Psychol 52: 519-523.
6. Koch KL, Stern RM, Vasey M, Botti JJ, Creasy GW, et al. (1990) Gastric dysrhythmias and nausea of pregnancy. Dig Dis Sci 35: 961-968.
7. Stern RM, Koch KL, Leibowitz HW, Lindblad IM, Shupert CL, et al. (1985) Tachygastria and motion sickness. Aviat Space Environ Med 56: 1074-1077.
8. Koch KL, Stern RM (2004) Handbook of Electrogastrography.
9. Koch KL, Stern RM, Stewart WR, Vasey MW (1989) Gastric emptying and gastric myoelectrical activity in patients with diabetic gastroparesis: effect of long-term domperidone treatment. Am J Gastroenterol 84: 1069-1075.
10. Brzana RJ, Koch KL, Bingaman S (1998) Gastric myoelectrical activity in patients with gastric outlet obstruction and idiopathic gastroparesis. Am J Gastroenterol 93: 1803-1809.
11. Parkman HP, Hasler WL, Barnett JL, Eaker EY; American Motility Society Clinical GI Motility Testing Task Force (2003) Electrogastrography: a document prepared by the gastric section of the American Motility Society Clinical GI Motility Testing Task Force. Neurogastroenterol Motil 15: 89-102.
12. Szurzewski JH Electrical basis for gastrointestinal motility. In: Johnson LR, editor. Physiology of the Gastrointestinal Tract, 2nd edition.1987:388-422
13. Sanders KM, Koh SD, Ward SM (2006) Organization and electrophysiology of interstitial cells of Cajal and smooth muscle cells in. The gastrointestinal tract. In: Johnson LR, et al eds. Physiology of the Gastrointestinal Tract 4rth edition.
14. Owyang C, Hasler WL (2002) Physiology and pathophysiology of the interstitial cells of Cajal: from bench to bedside. VI. Pathogenesis and therapeutic approaches to human gastric dysrhythmias. Am J Physiol Gastrointest Liver Physiol 283: G8-15.
15. Parkman HP, Miller MA, Trate D, Knight LC, Urbain JL, et al. (1997) Electrogastrography and gastric emptying scintigraphy are complementary for assessment of dyspepsia. J Clin Gastroenterol 24: 214-219.
16. Lin Z, Eaker EY, Sarosiek I, McCallum RW (1999) Gastric myoelectrical activity and gastric emptying in patients with functional dyspepsia. Am J Gastroenterol 94: 2384-2389.
17. Randall CW, Taboada CM, Zurita VF (2005) Utilization of electrogastrography to determine treatment of patients with symptoms of dyspepsia and gastroparesis. Am J Gastroenterol
18. Randall CW, Zaga J, Vizuete J Electrogastrography provides diagnostic accuracy and thereutic options in patients with non-ulcer dyspepsia: a 12 year study. In review.Gastroenterology.
19. Randall CW, Taboada CM, Zurita VF (2005) Electrogastrographic results of outpatients presenting with symptoms of dyspepsia or gastroparesis. Am J Gastroenterol. September.
20. Randall CW, Lui A. Taboada CM (2006) Does the treatment of tachygastria - associated non-ulcer dyspepsia improve quality of life? Am J Gastroenterol.
21. Meissner K (2009) Effects of placebo interventions on gastric motility and general autonomic activity. J Psychosom Res 66: 391-398.