Utilizing Electrogastrography in the Evaluation of Idiopathic Dyspepsia

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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 Tunpeace [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 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 2.5-3.75 Cycles 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 gastromorphs 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 bradygastria 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
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