

ADVANCES IN GERD

Current Developments in the Management of Acid-Related GI Disorders

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The Role of High-Resolution Manometry in Gastroesophageal Reflux Disease



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G&H What is high-resolution manometry primarily used for? What is its role with gastroesophageal reflux disease?

CPG High-resolution manometry (HRM) is primarily used for the evaluation of unexplained dysphagia following endoscopy or barium radiography, and for confirmation of a motor diagnosis when suspected on alternate testing. However, the most common indications for HRM are to localize the lower esophageal sphincter (LES) for the placement of pH and pH-impedance probes, which are used to quantify esophageal reflux burden, and to evaluate symptoms of gastroesophageal reflux disease (GERD). HRM is also used for the investigation of esophageal symptoms that are unresponsive to symptomatic management and unexplained by endoscopy or barium studies. Behavioral disorders, such as supragastric belching and rumination syndrome, as well as achalasia and esophageal outflow obstruction can mimic GERD symptoms and can be excluded using HRM. Finally, HRM can characterize esophagogastric junction (EGJ) barrier function and EGJ morphology, which can be part of the pathophysiology of GERD.

G&H How is HRM performed in patients with GERD, and how does it differ from conventional manometry?

CPG Conventional manometry utilizes a few pressure recording sites in the esophagus and is displayed using stacked line tracings. HRM utilizes circumferential solid-state pressure sensors placed 1 cm apart on a catheter positioned across both the upper esophageal sphincter and the LES, allowing the pressure profile of the entire esophagus and both sphincters to be acquired simultaneously. Esophageal pressure data are recorded, assimilated, and displayed using dedicated software programs, which also fill in best-fit data between the recorded data points and assign colors to pressure values. Consequently, pressure profiles can be displayed in topographic fashion using color contours, which are easier to interpret. HRM is a shorter procedure for the patient compared to conventional manometry. The standard swallow sequence is the same with HRM or conventional manometry, including evaluation in GERD patients, and consists of 10 water swallows in the supine position. HRM can be combined with stationary impedance, termed high-resolution impedance manometry, in which the swallowed bolus can be visualized in relation to pressure events on the topographic plots.

G&H What training is needed to perform HRM?

CPG HRM is a simple procedure for both the operator and the patient. The operator has an important role

in getting the patient to relax and putting the patient at ease before and during the procedure, which results in a better study without artifacts from gagging, retching, or repetitive swallowing. The placement of an HRM catheter is similar to that of a nasogastric tube, and can be learned with relative ease. HRM software programs provide step-by-step guidance for calibration, set up, and implementation of data collection. Apprenticeship with a trained operator for 1 to 2 weeks is typically enough to learn the basics of catheter placement and data acquisition. While interpretation is also intuitive, proctored interpretation of as many as 100 studies may be needed for confident interpretation. Distinguishing a normal study from an abnormal study and identifying achalasia typically require fewer cases of proctored interpretation. HRM software systems provide algorithmic interpretations using software tools, but these interpretations need to be confirmed by deliberate inspection of the studies. Novel web-based HRM teaching modules have been designed and tested with positive results.

G&H What tests can be used in conjunction with HRM?

CPG Provocative testing can be used in addition to the 10-swallow sequence. The 2 most common provocative tests are multiple rapid swallows, in which the patient performs 5 swallows in rapid sequence, and the rapid drink challenge, in which the patient drinks 100 to 200 mL of water through a straw as quickly as possible. Multiple rapid swallows assess the ability of the esophageal smooth muscle to withhold contraction during repetitive swallowing (deglutitive inhibition) and to augment contraction following the last swallow of the sequence (contraction reserve). Absence of contraction reserve is associated with higher esophageal reflux burden and a higher likelihood of dysphagia following standard fundoplication. The rapid drink challenge assesses for esophageal outflow obstruction, and the increased volume of fluid can create a visible obstructive pattern with compartmentalization of intrabolus pressure or panesophageal pressurization in the esophageal body if there is an obstructive process at the EGJ.

Other provocative tests are the standardized test meal and postprandial monitoring. Administration of a meal during the HRM procedure can be useful in demonstrating an obstructive pattern in patients with dysphagia when standard water swallows do not demonstrate abnormality. Monitoring for 30 to 60 minutes following a test meal can be helpful in diagnosing rumination syndrome and supragastric belching. Upright swallows can be beneficial in evaluating the reliability of identification of esophageal outflow obstruction.

Viscous swallows, bread swallows, and marshmallow swallows have been used as part of provocative testing during HRM with stationary impedance but are not as universally utilized as multiple rapid swallows and the rapid drink challenge.

G&H What is the reliability of HRM in distinguishing patients with GERD from the general population?

CPG Neither HRM nor conventional manometry can provide a distinction between patients with GERD and patients without GERD. The most common motor pattern in GERD is a normal pattern. However, there are some findings that are seen more often in patients with GERD that may explain mechanisms underlying persistent symptoms. For instance, a disrupted EGJ can manifest with low LES basal pressures, a low EGJ contractile integral, and a hiatal hernia, all of which can be identified on HRM. In fact, when using surgical identification of a hiatal hernia during laparoscopy as the gold standard, HRM is more reliable in detecting a hiatal hernia compared to endoscopy or even barium radiography. Hypomotility patterns in the esophageal body, including ineffective esophageal motility, fragmented peristalsis, and absent contractility, are identified more often in patients with GERD compared to patients without GERD, but these motor patterns are not pathognomonic for GERD. Therefore, HRM cannot be used to segregate patients with GERD from those without GERD, but HRM findings can help explain part of the pathophysiology of reflux in patients with persistent esophageal symptoms despite GERD treatment.

G&H What are the main benefits associated with HRM?

CPG HRM has a higher sensitivity for motor diagnosis compared to conventional manometry. The Clouse plots are distinctive in health and disease, and with pattern recognition, esophageal motor disorders can be easily identified. Because data are digitally acquired and displayed, software tools can be used to interrogate esophageal sphincter tone and relaxation, vigor of smooth muscle contraction in the esophageal body, and timing of esophageal peristalsis. Clouse plot patterns and algorithmic interpretation schemes can be used to teach esophageal pathophysiology and esophageal motor disorders to medical students as well as to novices who are interested in esophageal motor disorders.

G&H What are the main limitations associated with HRM?

CPG While HRM can identify abnormal motor patterns with higher sensitivity compared to conventional manometry, or to other ancillary procedures such as barium radiography and endoscopy, HRM findings do not always correlate with symptoms or translate into management recommendations and do not consistently represent actionable motor patterns. The value of an abnormal HRM study is highest when esophageal outflow obstruction is identified, especially if achalasia is diagnosed. However, achalasia remains possible without typical findings on HRM. Major esophageal motor disorders (eg, hypercontractile peristalsis, distal esophageal spasm, absent contractility) can all be associated with an obstructive component, and alternate testing (eg, barium radiography, functional lumen imaging probe) may be needed to demonstrate or refute actionable obstruction in these major motor disorders. Minor esophageal motor disorders (eg, ineffective esophageal motility, fragmented peristalsis) are not pathognomonic of abnormality, as these motor patterns can be encountered in patients who have no symptoms as well as in patients with GERD.

Patients are generally apprehensive about having a catheter inserted through their nostril, and may gag, retch, or regurgitate during the procedure. There may be discomfort with nasal intubation, and, rarely, nosebleeds can occur. If the esophagus is dilated, especially with esophageal outflow obstruction within the achalasia spectrum, the catheter may curl in the esophagus and may have difficulty traversing the EGJ. In this setting, placement of the catheter under endoscopic guidance may be needed.

G&H Can HRM be used in pediatric patients?

CPG Yes. Special, smaller catheters are available for use in younger children. Protocols similar to those for adults can be utilized. Provocative testing is also possible. However, the degree of cooperation from younger children especially is variable. Children may not tolerate the procedure as well as adults, and, therefore, the study should not be performed unless there is a clear need for identification of the esophageal motor pattern. Sometimes, barium radiography is performed instead, which is better tolerated.

G&H Are there any patients in whom HRM should be avoided?

CPG HRM should be avoided in patients who cannot tolerate the procedure or who are extremely apprehensive. In these settings, the catheter is occasionally placed during sedated endoscopy if the procedure is vital to patient

management. Due to the risk of bleeding, patients with coagulopathy should not undergo HRM. Patients who may not be able to tolerate water swallows are not ideal candidates because of the risk of aspiration from oropharyngeal dysfunction. In addition, patients who have esophageal obstructive processes such as strictures should avoid HRM, as strictures are usually identified on endoscopy, and HRM may not add much to the diagnosis and management. Finally, there may be difficulty in placing the HRM catheter in patients with nasal passage abnormalities.

G&H What research is currently being done?

CPG Studies are underway to identify metrics and diagnoses that predict management outcomes, especially in the context of GERD, mainly through multicenter data collection. These collaborative studies are also addressing whether better classification of motor findings and more intuitive interpretation of provocative tests are needed. A multinational and multisociety working group is evaluating the current version of the classification system used for the characterization of esophageal motor disorders (Chicago Classification v3.0), and is developing the next version of this classification. Priorities for the working group include outlining a more specific diagnosis of esophageal outflow obstruction, revising criteria for the designation of hypercontractile and spastic disorders, and better characterizing minor disorders of peristalsis.

Dr Gyawali has consulted for Medtronic, Diversatek, Ironwood Pharmaceuticals, IQVIA (formerly Quintiles), and Torax Medical, and has been a speaker for Medtronic and Diversatek.

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