discussed in the commentary). These are not "swallow-induced primary peristalsis on an obstructing balloon." First, they are not primary peristalsis; they are distention-induced secondary peristalsis elicited in a fully sedated patient. Second, the FLIP is not a balloon; it is a highly compliant fluid-filled bag. Third, the FLIP does not obstruct the esophagus; it tracks esophageal contractions as they traverse the length of the probe, measuring both the degree to which they occlude the lumen and their rate of propagation. Fourth, RACs were not "missed" in 8 of 10 subjects; they were seen in 8 of 10 normal subjects.[5]

The rule of 6 criteria for RACs (6 repetitive contractions spanning at least 6 cm of the FLIP probe and occurring at a frequency of $6 \pm 3$ per minute) was devised as a physiomarker of normal function on FLIP panometry.[3,4] In a cohort of >700 subjects that completed both FLIP panometry and HRM, the RAC pattern was observed in 89% (31/35) of the normal control subjects; the remainder had antegrade contractions that did not meet the rule of 6 criteria. Equally notable, 87% of patients with a RAC pattern on FLIP had normal primary peristalsis on HRM.[4] Another notable aspect of the RAC response is its negative predictive value for achalasia; RACs were observed in 0 of 224 patients with treatment-naive achalasia defined by HRM (55 type I, 129 type II, 40 type III).[4] Patients with achalasia also consistently have an abnormal esophagogastric junction (EGJ) opening on FLIP, assessed using the FLIP metrics EGJ distensibility index (EGJ $mm^2$/mm Hg at 60-mL fill volume) and maximum EGJ diameter.[6] Thus, a FLIP panometry study can identify achalasia when there is a reduced EGJ opening and an abnormal contractile response or exclude achalasia (and often obviate the need for an HRM study) when there is a normal EGJ opening and a RAC pattern.[3,7] Furthermore, as advocated in the Chicago classification v4.0,[8] FLIP panometry can be used to clarify otherwise equivocal HRM cases, particularly EGJ outflow obstruction, wherein HRM findings can be artefactual.

The final chapter of the FLIP panometry story has yet to be written. Similar to the serial updates of the Chicago classification for HRM, we anticipate an evolution in interpretive schemes for FLIP panometry. However, although we agree that further studies will lead to a better understanding of the relevant pathophysiology, FLIP is not an experimental device. Rather, FLIP panometry is *currently* a valuable diagnostic tool with mounting clinical data supporting its use. We completely disagree that the FLIP is either "inadequately evaluated" or a "risky procedure."[1] Negative assessments like this should not be made lightly because they can have important consequences. FLIP panometry is a new, exceptionally safe technology that can be used to detect esophageal motility disorders in conjunction with a diagnostic endoscopy in a comfortably sedated patient.

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**Conflicts of Interest**
The authors disclose the following: Peter J. Kahrilas, Dustin A. Carlson, and Northwestern University hold shared intellectual property rights and licensing agreements with Medtronic Inc. Peter J. Kahrilas is a consultant for AstraZeneca, Ironwood, Reckitt, and Johnson & Johnson. Dustin A. Carlson is a speaker for Medtronic and a consultant for Medtronic and Phathom Pharmaceuticals.

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**Most current article**

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**Reply.** I thank Drs Carlson and Kahrilas for clarifying the basis of their case for functional luminal imaging probe (FLIP) panometry in clinical practice.[1] The authors accept that the criteria they have proposed for the interpretation of the results of the FLIP panometry would require serial updates. The authors liken the evolution of FLIP panometry to their experience with high resolution manometry (HRM) in the Chicago classification of esophageal motility disorders. The evolution of HRM diagnostic parameters illustrates the shortcomings of commercially motivated premature widespread clinical use of that technique.

Clouse et al[2] introduced HRM to present the topography of contraction plots at each point on the esophageal peristaltic wave, using water-filled catheters. The reviewers at the time left it to future studies to prove if HRM was a better mousetrap or manometric overkill[3] or if HRM would make the traditional manometric techniques dinosaurs.[4] Beginning in 2005 the Chicago group started efforts to prove the superiority of HRM and FLIP panometry using solid-state monitoring probes in the diagnosis of esophageal motility disorders. The new diagnostic parameters that were proposed and included in HRM were integrated relaxation pressure and distal contractile integral. Cases with impaired integrated relaxation pressure are considered to have either achalasia or a descriptive diagnosis of esophagogastric junction outflow obstruction (EGJOO), depending on the absence or presence of normal esophageal peristalsis. The parameter distal contractile integral provided a cumulative value of the

distal contraction volume that ignores the promise of providing contractile information at each point on the peristaltic wave.[2] Cutoff values used for different definitive diagnoses were median values that were not validated by reproducibility data and proper discriminative statistics.

Effective marketing led to the widespread use of HRM without properly validated diagnostic criteria and without pathophysiologic underpinning. As a result, the use of the initially proposed criteria for achalasia and EGJOO led to the overdiagnosis of achalasia and faulty treatment. The cutoff values of different severities of distal contractile integral values for the hypercontractile esophagus were arbitrarily proposed and revised.[5,6] Distally increasing the latency gradient is a fundamental component of peristalsis.[3] It was not even used as a parameter for the differential diagnosis of esophageal motility disorders. A single arbitrary value of distal latency was only added in the later versions. After 15 years of its introduction, the labeled gold standard test for the diagnosis of esophageal motility disorders has been revised many times, mostly by show of hands. These changes have only shifted the diagnostic entities into different pigeonholes. We are currently in the fourth version.[5] It is unclear how many more versions will be required to have a final recommendation!

The authors suggest that FLIP panometry is expected to follow a similar interpretative path as HRM. Learning from the evolution of HRM, the tedious evolution of the interpretative criteria for FLIP panometry should be avoided by understanding the nature of the panometry waves before its vigorous commercialization. After almost 200 research and clinical papers on FLIP panometry, important data regarding the nature of the pressure wave are still missing.[1] Statements are made as facts without evaluating them. How do the authors know that the FLIP bag pressures are not related to repetitive swallows induced by esophageal obstruction or secondary peristalsis?[1] Do they represent a motor pattern unique to a distending or obstructing bag? Without relating the pressures to a known pathophysiology, it is not possible to understand their clinical relevance.[6] The authors suggest that future studies will provide an understanding of relevant physiology and pathophysiology. That is like placing the cart before the horse! Clinical practitioners would like to know the nature of the pressure waves and their clinical relevance.

FLIP panometry is classified as a minimally invasive procedure that is performed under fentanyl anesthesia under the care of an anesthetist. No wonder the patients are very happy with the procedure. The cumulative bill for the procedure is thousands of dollars. Technical issues related to the technique are still unrsolved.[7] Minimally invasive procedures under anesthesia are usually performed as lifesaving treatments and for obtaining critical diagnostic information that is not available by other means. That is not the case for FLIP panometry.

I did not make a negative assessment of the FLIP device, I only pointed out that FLIP panometry has been pushed for widespread clinical use without valid diagnostic parameters and evalution.[8] I did not make these comments lightly. My assessment may reflect my bias, and the authors reflect theirs. It may be time for independent expert evaluation to assess whether FLIP panometry in its current state provides diagnostic information that is not available from noninvasive techniques[3–5] and if its commercially oriented push for widespread clinical use is justified.

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**Conflicts of interest**
The author discloses no conflicts.

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## Correction

Maringhini A, Maringhini M. Bile and Liver in Pregnancy: No One Split Apart What God Has Joined Together. Gastroenterology 2023;164:310–311.

In the above article, the second author, Dr Marco Maringhini from Medicina Interna 1, ARNAS Civico, Palermo, Italy, was inadvertently omitted from the author byline. The correct author list should be as follows: Alberto Maringhini and Marco Maringhini. The article has been corrected online.