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Reaction to articles on high resolution manometry, the length of the lower esophageal sphincter and the diagnosis of gastroesophageal reflux disease

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Dear Editor,

In the journal **Arquivos de Gastroenterologia**, two articles were published simultaneously, emanating from one institution and devoted to high resolution manometry (HRM) of the esophagus and the lower esophageal sphincter[1,2]. The first study aims to determinate the normative data for a new 24 channel water-perfused HRM[1]. In this study the basic methodological principles have been violated.

I. Selection of volunteers as healthy individuals is erroneous.

First, gastroesophageal reflux disease (GERD) for a long time can proceed without clinical manifestations. So, for example, with a screening gastroscopy examination of 6,683 healthy Koreans, 14.66% had GERD diagnosed[3]. In another study of 57 healthy subjects, 13 (23%) had an esophageal pathology in endoscopy, and 10 (17%) had an esophageal hernia[4].

Secondly, as histological studies of recent years have shown, GERD begins with reflux only into the abdominal segment of lower esophageal sphincter (LES), when the acidic gastric contents do not yet enter the esophagus, and, consequently, the disease cannot be detected using pH-metry. There are no symptoms of GERD at this stage[5].

Since no histological studies have been carried out, the selected volunteers cannot be considered healthy and therefore the obtained results cannot be considered normative.

II. The study ignores known physiological laws.

First, the entering of the bolus into the esophagus triggers primary peristalsis. Generally, in peristalsis, the area ahead of the bolus is relaxed, and the area behind the bolus is undergoing peristaltic contraction which allows for the bolus to be propelled forward[6]. This is the Bayliss-Starling law. This law stating that a stimulus within the intestine (that is, the presence of food) initiates a band of constriction on the proximal side and relaxation on the distal side and results in a peristaltic wave. The study of esophageal peristalsis with a probe is unphysiological, since the probe stretches the esophagus wall all along its length and disrupts peristalsis, as can be seen in the figures.

Secondly, measurements of basal pressure and length of the lower esophageal sphincter have low accuracy, which is evidenced by a wide range of individual indicators. (Total LES length -3.82±0.95; range -1.6-5.7 cm) (Basal pressure -77.41±63.13; range -12.2-309.3 mmHg). Although the averages are within the limits obtained by other researchers, they cannot be used for diagnostic purposes because of the large range of indicators.

Abdominal compression causes an increase an intra-abdominal and intragastric pressure. This leads to a reflex increase of the LES pressure[7]. In healthy individuals, the last peristaltic wave overcomes the tone of the LES and the contrast agent penetrates from the esophagus into the stomach without delay. In GERD, the force of the last peristaltic wave weakens, so during the compression of the abdomen, the contrast agent lingers over the contracted LES (FIGURE 1. A). We measured the length of the LES in patients

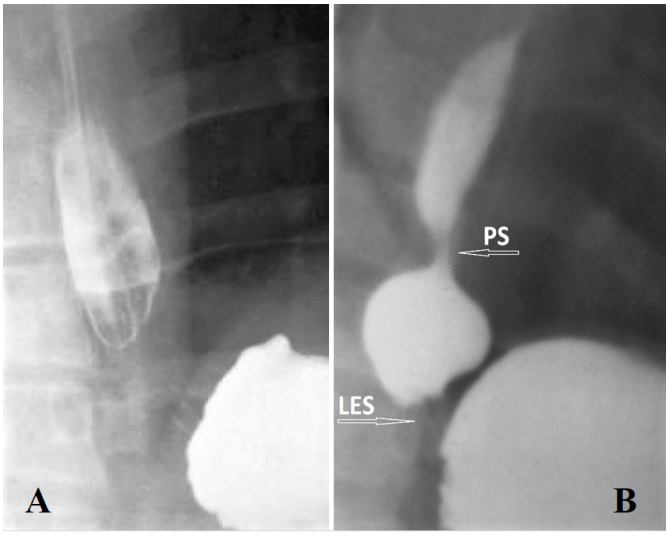

FIGURE1. (**A**)X-ray picture of the GEJ of a patient with a GERD.There is a contraction of the LES during the abdominal compression, which caused the barium bolus to stop moving. The length of the gap between the barium-containing esophagus and the stomach is a LES contraction. (**B**) The child aged 7 with GERD. Compression of the abdomen during the reception of barium led to a contraction of LES. Its length is 0.7 cm (the norm for this age is 1.5-1.9 cm). The proximal sphincter closes the phrenic ampulla to create a threshold pressure and to open the LES

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of different ages, who had the initial stage of the GERD and the length of the LES did not have time to change. These results were like those obtained during the manometric studies by different researchers. Therefore, we consider them as the age norm (TABLE)[8].

TABLE 1. Normal length of LES in different age groups.

	Length of the lower esophageal sphincter (cm)					
Age	Up to 1 year	1–3 years	4–7 years	8–10 years	11–15 years	21–65 years
Range	0.7–1.0	1.2–1.5	1.5–1.8	1.9–2.3	2.3–2.9	3.2–4.2
M ± m	0.86± 0.03	1.40± 0.02	1.72± 0.07	2.10± 0.05	2.45± 0.11	3.60± 0.08

FIGURE (A) X-ray picture of the GEJ of a patient with a GERD. There is a contraction of the LES during the abdominal compression, which caused the barium bolus to stop moving. The length of the gap between the barium-containing esophagus and the stomach is a LES contraction. (B) The child aged 7 with GERD. Compression of the abdomen during the reception of barium led to a contraction of LES. Its length is 0.7 cm (the norm for this age is 1.5-1.9 cm). The proximal sphincter closes the phrenic ampulla to create a threshold pressure and to open the LES.

III. The purpose of the second article was to study the role of transdiaphragmatic pressure gradient (TPG) on GERD pathophysiology[2].

The authors measured in "healthy" subjects gastric / abdominal pressure (AP) and esophageal / thoracic pressure (TP) using HRM. Both pressures are calculated based on the average pressure in a 30 s period encompassing all phases of the respiration. The authors came to an absurd result that they were not able to explain. As in the studies of predecessors, the AP (11.6±4.5 mmHg), turned out to be significantly higher than the TP (7.4±5.4 mmHg). If this study is correct, then during the opening of the LES, the bolus should move in a retrograde direction - from the stomach into the esophagus.

First, as noted above, the probe violates the peristaltic movement and does not register the peak of the peristaltic wave.

Secondly, to assess the effectiveness of the antireflux function of the esophago-gastric junction, it is important to register the strength of the last peristaltic wave during swallowing but not the resting pressure over the LES.

The last peristaltic wave creates a high pressure proximal to the LES. When the pressure reaches the threshold value, the LES opens and a bolus is injected under the high pressure into the stomach. This is clearly seen in patients with GERB (FIGURE 1.B). Continued reflux of gastric contents with a low pH leads to expansion of the esophagus (phrenic ampulla) and weakening of its motility. To create a threshold pressure, the ampulla overlaps proximally by the functional sphincter (proximal sphincter – PS). During contraction of the ampulla, the pressure in it increases. When it reaches the threshold pressure, the LES opens and the ampulla injects its contents into the stomach. After this LES closes[8].

I think it is necessary to start a broad discussion in order to choose rational methods of scientific research and diagnostics of diseases of the esophagus and the gastroesophageal junction.

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