Characteristics of the Phasic Intraluminal Pressure Waves of the Stomach and Duodenum

Studies in Normal Subjects and Ulcer Patients

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Intraluminal pressures in the digestive tract have interest in relation to the physiologic activities of the gut. Mixing and trituration of gastrointestinal contents are dependent on local pressure changes. The phasic intraluminal pressure changes have been correlated with the mechanics of gastric evacuation in experimental animals. Since movement of the gastrointestinal contents depends upon the pressure gradient within the lumen, the simultaneous measurement of intraluminal pressures from several points has been suggested as a means for estimating gastrointestinal motor activity.

The phasic waves from the gastrointestinal tract have been classified on the basis of function, rhythmic characteristics, and amplitude and duration. The classification most frequently employed is that of Templeton and Lawson as modified by Adler, Atkinson, and Ivy.

Code and co-workers have utilized a modified Templeton and Lawson classification as the basis for their quantitative approach.

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to the study of gastrointestinal motor activity. The duration of the various waves, originating from the gastrointestinal tract, is measured and totaled. A quantitative estimate of gastrointestinal motor activity may be obtained by expressing the phasic pressure-wave activity of a given type as a percentage of the total time of observation. A balloon method was employed for most of these studies, but a few observations were made comparing the data obtained with the balloon method with those obtained with an in vivo transducer.6, 9, 10, 11 The incidence and general characteristics of the phasic intraluminal pressure waves recorded with the in vivo transducer were compared with the phasic waves recorded simultaneously by balloon system of recording.

Although the open-tip catheter–external transducer system has been used to study the gastrointestinal motor activity of human subjects,12, 13, 14 statistical studies have not been reported concerning the parameters and incidence of the waves recorded with this system. It seemed desirable to carry out a statistical study of the phasic intraluminal pressure waves so that a working classification might be established. This classification could then be used for quantitative studies correlating intraluminal pressure waves with motor activity.15, 16

METHODS and MATERIALS

Intraluminal pressure-wave recordings from the stomach and duodenum were obtained from 10 normal subjects and 56 patients with gastric or duodenal ulcer. Three rubber catheters (#10 Fr.) were inserted into the stomach and duodenum. The catheters measured 120 cm. in length and had an internal diameter of 1 mm. They were arranged so that the recording tips were 5 cm. apart. Patency of the catheters was maintained by perfusing isotonic saline at a rate of 6 ml. per hour. The intraluminal pressures were recorded by external transducers (Statham Model P23B 4G-300) whose electrical output was applied to a continuously recording 4-channel carrier amplifier and recorder.

The subjects were studied after a 12-hour fast. The distal tube was located in the duodenum, the middle one in the antrum, and the proximal one in the body of the stomach. Intraluminal pressures were recorded for approximately a two-hour period. This included a 30- to 60-minute control period and a similar period fol-