Technique

The measurement of gastric transmucosal potential difference through a gastroduodenoscope

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The existence of a gastric transmucosal electrical potential difference has been recognized for many years. Goodman (1942) claimed that changes in the electrical potential difference across the gastric mucosa may be of value in the differential diagnosis of gastric disorders. Ingram (1953) confirmed much of this work and Andersson and Grossman (1966) showed that the difference in gastric and duodenal electrical potential difference was of value in accurately demarcating the duodenal-gastric junction. Until 1970 most workers used skin as the site of the reference electrode. Geall, Code, McIlrath, and Summerskill, (1970a), however, showed that the use

of venous blood rather than skin as the site of reference electrode was equivalent to having an electrode on the serosa of the bowel.

Studies of the transmucosal electrical potential difference in the stomach and duodenum have been hindered by the difficulty in localizing the probe electrode accurately. We have used the fiberoptic gastroduodenoscope to introduce the probe electrode into the stomach. This technique allows the accurate recording of electrical potential difference at anatomical and pathological sites of choice in the stomach and duodenum.

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Transmucosal electrical potential difference was measured by the method described by Geall *et al* (1970), based on the work of Davenport, Warner, and Code (1964), and Andersson and Grossman (1965). The electrolyte bridge of the gastric electrode consisted of polyethylene tubing (ID 1.65 mm) containing saturated KCl in 3% agar. The intravenous electrolyte bridge consisted of a polyethylene

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Fig Electrical potential difference recorded in duodenum and body of stomach through a gastroduodenoscope.

tube (ID 0.86 mm) containing saturated KCl in 3% agar. After sterilization the electrode was introduced through a 14-gauge needle. Each electrolyte bridge rested in a beaker containing saturated KCl and two balanced calomel half cells (Beckman fibre-junction type) connected to a potentiometric recorder (Watanabe Servocorder model SR651-2). The recorder gave a continuous write out for study and record.

The gastric electrode was passed through the forceps channel of the gastroduendoscope (Olympus GIF-D) and the instrument passed using standard techniques. Once routine endoscopic examination was complete it was possible to record the electrical potential difference in any desired area of the stomach and duodenum under direct vision, and to demarcate accurately the gastro-duodenal junction.

A tracing of transmucosal electrical potential difference showing difference in duodenal and gastric (body) recordings is shown in the figure.

Comment

This method of measuring transmucosal electrical potential difference gives accurate recordings taken under direct vision. Before this one had to rely on repeated x-ray screening of the probe electrode, and knowledge of the distance from the distal end of the probe to incisor teeth for localization of the intra-gastric electrode. The value of such a technique includes the further study of electrical potential differ-

ence under direct vision at different areas of the normal stomach and the study of the value of gastric mucosal electrical potential difference measurements in the diagnosis of gastric and duodenal pathological states such as gastritis, duodenitis, and gastric tumours. Geall, Phillips, and Summerskill (1970b) showed that salicylates, alcohol, and bile acids could alter the electrical potential difference across the gastric mucosa. Using the method described above the effect of such compounds, alone and in combination, on the gastric mucosa in various pathological states may be accurately studied.

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