Short Communication / Kurze Mitteilung

The Effect of Intestinal Hormones on Splanchnic Circulation

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Summary. The influence of acidification of the duodenal contents, of intravenous secretin, cholecystokinin and pancreozym injections on hepatic (HAF) and left gastric artery (GAF) and on portal vein blood flow (PVF), bile and pancreatic juice output was studied in dogs. Acid introduction into the duodenum increased HAF and PVF by 20 and 25%, respectively. GAF did not change significantly. Secretin and cholecystokinin also increased PVF by 25% but HAF changes were less than after acidification. Pancreozym increased significantly only HAF. There were also differences between the effects of duodenal acidification and of the individual hormones on bile and pancreatic juice excretion. It is concluded, that splanchnic circulatory changes observed following duodenal acidification are not produced by the action of a single intestinal hormone but are due to the interplay of several factors.

Key words: Feeding-effect on intestinal circulation - Hormonal regulation of splanchnic circulation - Intestinal hormones - Splanchnic circulation-effect of hormones and feeding.

Splanchnic blood flow has been repeatedly shown to increase following a meal [4, 5, 8, 9]. The flow changes are probably mainly due to a reflex stimulation by the acid gastric contents reaching the duodenum. In the dog the introduction of dilute hydrochloric acid into the duodenum leads to a marked increase of both hepatic artery and portal venous flow. The receptors are situated in the duodenal mucosa and they can be blocked by lidocain [1, 2]. On the other hand systemically administered intestinal peptide hormones increase superior mesenteric blood flow [7, 8, 10, 11]. It was suggested that physiological introduodenal stimuli may release sufficient endogenous intestinal hormones to account for the observed changes in blood flow [7]. In the present study to gain information Offprint requests to: Dr. Imre Benyó (address see above)
about the role of the intestinal hormones in the circulatory changes the influence of intraduodenal introduction of hydrochloric acid, and of systemic injections of secretin, cholecystokinin and pancreozym on hepatic and gastric artery, and on portal vein blood flow was investigated in anaesthetized dogs.

**Material and Methods**

The experiments were done on 10 mongrel dogs under pentobarbital anaesthesia. The abdomen was opened by a midline incision and a plastic tube was introduced into the upper part of the duodenum. The cystic duct was ligated, the common bile duct and the major pancreatic duct were cannulated. Electromagnetic flow probes (Nycotron, Dramen, Norway) were placed around the portal vein, the hepatic artery and the left gastric artery. Systemic arterial and portal venous pressures were measured with Statham strain gauges.

After the stabilization of the pressure and flow values, at least 30 minutes after the conclusion of the surgical procedures 3 ml/kg body weight 0.1 N hydrochloric acid was introduced into the duodenum and the flow and pressure changes were registered. After the return of the blood flows to the control level secretin 1.5 to 2.0 U/kg or cholecystokinin (CCK-PZ) 2.0 U/kg (both supplied by the GIH Research Unit, Karolinska Institutet Stockholm) and pancreozym (Boots) 2.0 to 2.5 U/kg were in turn injected intravenously at a random sequence and between the individual hormone injections the reaction to intraduodenal acid was repeatedly checked.

All blood flow values are standardized to 1 kg body weight and the results in the text and the tables are averages with ± s.e.m.

**Results**

Duodenal acid introduction increased in the 10 dogs hepatic artery flow (HAF) from 9.4 to 11.4 ml·min⁻¹·kg⁻¹ (+20.6%; P<0.01) portal vein flow (PVF) from 24.3 to 29.7 ml·min⁻¹·kg⁻¹ (+25.2%; P<0.01), left gastric artery flow (GAF) decreased slightly and not significantly from 1.28 to 1.16 ml·min⁻¹·kg⁻¹ (Table 1). Secretin (15 injections in 9 animals) produced similar flow changes in the portal vein (+24.7%) and left gastric artery (−4.7%) but the increase in HAF (+8.3%) was significantly smaller (P<0.05) than observed after duodenal acidification. After cholecystokinin administration (10 observations in 8 dogs) the HAF and PVF flow changes were essentially the same as after secretin. GAF flow was not reduced, but (not significantly) increased (+5.8%; P>0.05).

Pancreozym (5 observations) increased markedly HAF (25.1%; P<0.01) but did not influence PVF and GAF (Fig. 1).

The time course of the flow changes after single intravenous hormone injections was similar to that observed after intraduodenal acid: HAF and/or PVF begins to increase after ½ to 1 min, reaches a maximum in 3—6 min and declines again, to attain control level in 8 to 15 min. The values presented in the text and tables are the maximums observed after the individual interventions.

The analysis of the resistance changes (Table 2) shows, that duodenal acid introduction reduces splanchnic arteriolar, hepatic artery and portal venous inflow resistances. No significant change was seen in the left gastric art. inflow resistance. Secretin and cholecystokinín both reduced splanchnic arterial re-