The Effect of a Boots Preparation and Pure Natural Secretin and Pancreozymin on Pancreatic and Gastric Function in Man

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SUMMARY

Secretin was found to be a powerful inhibitor of basal gastric acid secretion in man. Pure natural secretin was more effective and more rapid in its action on gastric secretion than Boots secretin.

Boots pancreozymin and Swedish CCK (cholecystokinin) had a variable effect on basal gastric acid secretion and all the changes were modest and unimpressive.

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Recent studies reflect a highly integrated mechanism in the relationship between gastric and pancreatic secretion. Experimentally it has been shown that gastrin and pentagastrin increase pancreatic volume and enzyme secretion, but the results in man have been conflicting. Secretin is a relatively ineffective inhibitor of gastrin-stimulated acid secretion in the cat[1] but inhibits basal and gastrin-stimulated acid secretion and increases pepsin secretion in man.[2] Little work has been done on the effect of pancreozymin on acid secretion and the results have varied from a mild inhibitory to a stimulatory effect by different workers.

Structurally, gastrin and pancreozymin share the same terminal amino-acid linkage and secretin and glucagon have a similar molecular configuration. The present study reports our finding on the effect of various types of secretin and pancreozymin on basal gastric acid secretion in man.

MATERIAL AND METHOD

Pure natural secretin and pancreozymin (Jorpes and Mutt, Sweden) as well as a preparation by Boots (England) were used in this study. To assess the effects of these hormones on gastric function, it was necessary to establish the relative potency of the 2 secretin and pancreozymin preparations on pancreatic volume, bicarbonate and enzyme secretion at various dose levels.

After duodenal and gastric intubation under fluoroscopic control, dose response curves with 1, 2 and 4 intravenous units/kg body-weight of Boots secretin (Crick, Harper and Raper units) and 0·25, 0·5 and 1 intravenous units/kg body-weight of pure natural secretin (clinical units) were carried out in 4 subjects free of pancreatic disease and 1 with proved pancreatitis. Similar dose-response curves with pancreozymin were carried out in 2 patients using 1, 2 and 4 intravenous units of Boots pancreozymin/kg body-weight (Crick, Harper and Raper units) and 0·25, 0·5 and 1 units of Jorpes pancreozymin—cholecystokinin (CCK—Ivy dog units).

Collections from the duodenal tube were made under ice at 10-minute intervals for 90 minutes and the volume, bicarbonate, trypsin, chymotrypsin, lipase and amylase determined in each sample. After basal collections, gastric juice was aspirated through the gastric tube at 10-minute intervals for 60 minutes and the volume, acid concentration and acid output in each sample were measured.

RESULTS

Effect of the Secretin and Pancreozymin Preparation on Pancreatic Secretion

The mean volume output and bicarbonate concentrations at the various dosage levels of the 2 secretin preparations were tested in the 4 control patients. It was found that a dose level of 4 units of Boots secretin was equivalent in its effect to 0·25 - 0·5 units of pure natural secretin. The fit was best for volume and bicarbonate, the enzyme concentration being somewhat less amenable to this type of investigation. Fig. 1 shows the effect of 0·25 units of pure natural secretin and 4 units of Boots secretin on volume output, and bicarbonate and enzyme concentration in the individual subjects. With a few exceptions, the responses in all 6 parameters were similar in the 5 subjects tested, i.e. 1 unit of pure natural secretin was equal in potency to 10 - 16 units of Boots secretin.

Similar studies carried out with pancreozymin showed that 1 Ivy-dog unit of pure natural pancreozymin (CCK) was equal to 4 Crick, Harper and Raper units of Boots pancreozymin on pancreatic enzyme concentration and output.

Effect of the Secretin and Pancreozymin Preparations on Basal Gastric Acid Secretion

Fig. 2 shows the results of the total acid output per 10 minutes in 5 subjects given pure natural secretin in a

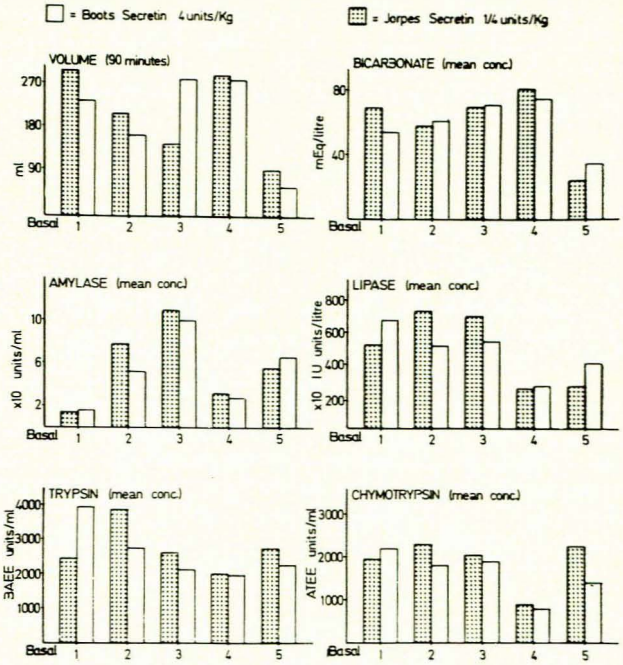

Fig. 1. Comparison between Boots Secretin (4 units/kg) and pure natural (Jorpes) secretin (0·25 units/kg) on pancreatic volume, and bicarbonate and enzyme concentration.

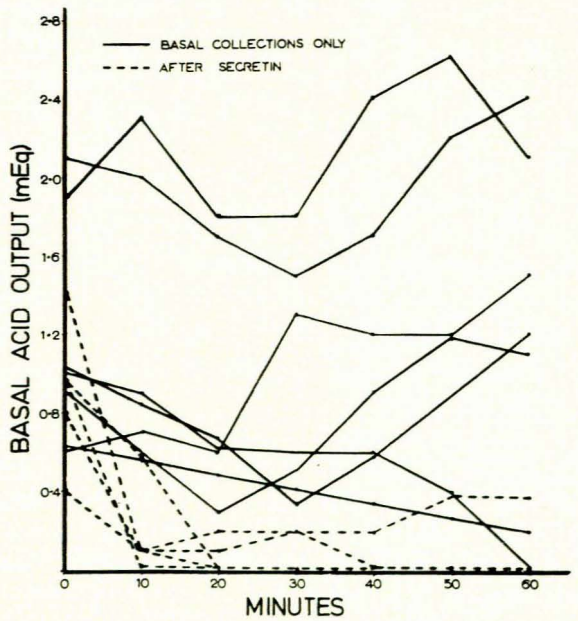

Fig. 2. Effect of pure natural secretin (0·25 units/kg) on basal acid secretion compared with a control group of basal collections only.

dose of 0·25 clinical units/kg body-weight and these are compared with 7 control subjects in whom the secretin was omitted, i.e. the basal collections were continued for 60 minutes. In the control subjects, basal acid output fluctuated at the 10-minute intervals and only 1 patient had a reduction to achlorhydric level at the 50 - 60-minute collection. In the 5 subjects who received secretin a reduction in acid output was recorded in all cases. A comparison between the control group and the subjects who were given 0·25 units/kg pure natural secretin and 4 units/kg of Boots secretin is shown in Table I. Most of the patients who received either secretin preparations showed a reduction in acid output, not infrequently to the level of basal anacidity. The reduction was more rapid after injecting pure natural secretin (Table I) and both secretin preparations appeared to reduce acid concentration more than the volume output.

TABLE I. EFFECT OF BOOTS AND PURE NATURAL SECRETIN ON BASAL ACID SECRETION

		Basal acid output		
Subjects	No. tested	Reduced	Achlorhydria	Onset of reduction (min)
Controls	**7**	**2**	**1**	**20 – 60**
Boots secretin				
4 units/kg	**4**	**3**	**2**	**20**
Pure natural secretin				
0·25 units/kg	**5**	**5**	**4**	**10**

Eight similar tests carried out with 1 unit/kg pancreozymin-cholecystokinin (CCK) and 4 units/kg Boots pancreozymin showed varying results. A moderate increase in acid output occurred in 2 patients with basal achlorhydria before the injection; a reduction in acid output occurred in 3 patients with initial acid secretion and the results were virtually unchanged in the remaining 2. All the effects were modest.

DISCUSSION

This study has confirmed the findings of Wormsley[3] that secretin is an inhibitor of basal gastric acid secretion in man. Further, secretin was able to reduce acid secretion to achlorhydric levels in patients with relatively low initial basal secretion and pure natural secretin was a more effective inhibitor than Boots secretin when doses of equal potency, as judged by their effect on pancreatic secretion, were administered. Although studies on the effect of secretin on stimulated gastric secretion were not carried out, it has been shown that secretin is a weak inhibitor of gastrin- or pentagastrin-stimulated secretion in man[2] and has a lesser effect on histamine-stimulated secretion. Johnson and Grossman[4] have shown that secretin acts as a non-competitive inhibitor of gastrin in dogs. Whether secretin production accounts for the whole inhibitory phase of gastric acid secretion after duodenal acidification[5] or after free fatty acids in the duodenum is uncertain but it is possible that secretin is in fact the only true enterogastrone.

We have been unable to confirm previous work by other authors that pancreozymin stimulates gastric acid secretion.[3] However, Wormsley[3] used much larger doses of pancreozymin which were not truly physiological. The present study suggests that pancreozymin has a variable and minor effect on gastric acid secretion, producing slight stimulation in some patients, mild inhibition in others and no effect in the majority of cases. Brooks and Grossman[2] found that pancreozymin (CCK) inhibited the pentagastrin-stimulated acid secretion by a mean value of 33% but even their individual results were variable. There was little difference between the Boots preparation and CCK in their relative effects on the basal acid secretion.

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