thoracic trunk were not disturbed, in none of these animals did visible reflex effects occur until ventricular dilatation had become extreme and there was advanced asphyxia.

Injection of the right coronary artery caused no visible reflex effects in 4 animals in which only the right cervicothoracic sympathetic trunk had been resected. Similarly, no reflex reaction was obtained in 4 of 5 animals in which the right upper thoracic trunk had been resected and the right cervical trunk left intact.

It is apparent, then, that the pain-fibers ending in the region of either coronary artery reach the spinal cord by way of the *ipsilateral* sympathetic chain. Furthermore, the great majority of these fibers must pass from the heart to the upper thoracic segments of that chain.

If this scheme of afferent innervation of the coronary arteries also applies in man, resection or injection of the upper thoracic portion of the *ipsilateral* sympathetic trunk should be the operation of choice for the relief of coronary pain. Moreover, the results suggest that reference of coronary pain to either upper extremity indicates stimulation of pain-endings associated with the coronary vessels of the corresponding side.

We wish to express indebtedness to Dr. J. F. Pilcher, who made the photographs.

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Relative Protective Value of Alkaline Duodenal Juices Against Gastrojejunal Ulceration.

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A review of the voluminous literature which has now accumulated on the relative protective value of the alkaline duodenal juices in preventing ulcer formation reveals a bewildering maze of confusion. Much of this diversity of opinions and contradictory experimental results has been due in great measure to the observations and comparisons made by different investigators under varied and diverse circumstances. Because of the existing difficulty in drawing conclusions from the confusing and contradictory experimental results, this investigation was made.

The investigation was divided into 4 groups of experiments: (1) Group 1—Severance of the pylorus and closure of both the gastric and duodenal ends and the reestablishment of continuity of the gastro-intestinal tract by gastrojejunostomy; (2) Group 2—Exactly the same procedure as in Group 1 but with the addition of transplantation of the common bile duct into the terminal ileum; (3) Group 3—Exactly the same procedure as was performed in the first group but with the addition of ligation and division of the accessory pancreatic (whenever it was found) and transplantation of main pancreatic duct into the terminal ileum; (4) Group 4—Exactly the same procedure as in Group 1 but with the addition of transplantation of both bile and pancreatic ducts into terminal ileum. Obviously all the groups are similar with the exception of one factor, the deviation of bile in one group, the deviation of pancreatic juice in another, and the deviation of both bile and pancreatic juice in the last group. Thus, because of the comparability of the 4 groups of experiments, any difference in results obtained can be accounted for by the one different factor characterizing each group.

A total of 60 dogs was used in the experiment—20 in the first group, 20 in the second, 10 in the third, and 10 in the fourth group. In Group 1, 50% of animals living from 9 to 271 days postoperatively developed typical subacute and chronic ulcers. These ulcers were grossly and microscopically similar to those occurring in man. All the ulcers developed at a characteristic site; *i. e.,* in the jejunal mucosa of the efferent loop. The probable explanations for the high incidence of ulcer formation after this procedure and their characteristic location are that the jejunal mucosa has little resistance to the acid gastric chyme, and the efferent loop of the jejunum is bathed with gastric chyme of relatively higher acidity than the afferent loop or the jejunal mucosa immediately opposite the stoma.

In Group 2, 90% of the animals living from 7 to 60 days postoperatively developed typical subacute and chronic ulcers. The 40% higher incidence of ulcer formation in this group than in Group 1 is probably due to the absence of bile in the alkaline duodenal secretions in the former group. Other differences in this group are: (1) the occurrence of ulcers in the anastomotic suture line in four instances with pieces of black silk hanging free from the base in 2, and (2) the occurrence of ulcers in the jejunal mucosa immediately opposite the stoma in 6 animals. The high incidence of these ulcers (anastomotic, 22.2% and opposite stoma, 33.3%) proximal to the usual site in the efferent loop emphasizes more strongly the acid neutralizing influence of bile.

In Group 3, 70% of the animals living from 7 to 56 days postoperatively developed typical subacute and chronic ulcers. There were 2 ulcers in the anastomotic suture line, one ulcer in the jejunal mucosa opposite the stoma, and one ulcer in the afferent loop. The 20% higher incidence of ulcer formation in this group as compared with Group 1 is probably due to the absence of the alkaline pancreatic juice in the former. The fact that in Group 2 there was a 20% higher ulcer incidence than in Group 3 and that ulcers occurred with greater frequency in the more unusual sites (anastomotic

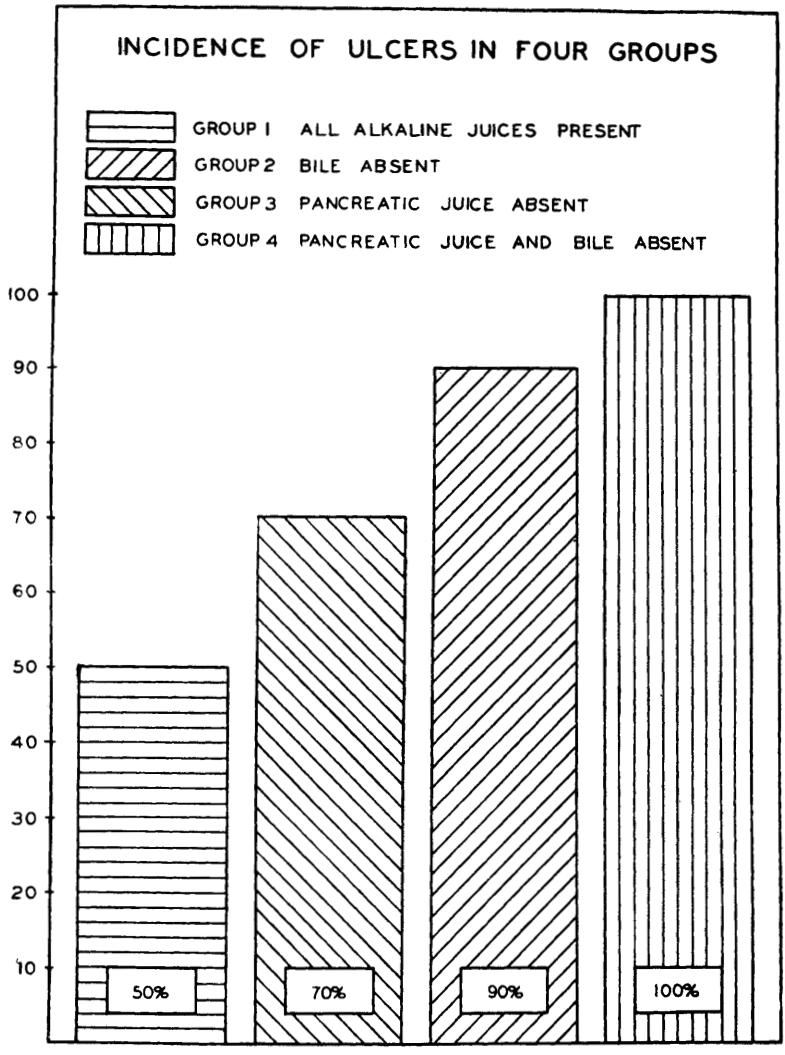

FIG. 1.

suture line and in jejunum opposite stoma) in the former indicates that bile probably exerts a greater acid neutralizing power than pancreatic juice.

In Group 4 all of the animals (100%) living from 12 to 51 days postoperatively developed typical subacute and chronic jejunal ulcers. As both the bile and pancreatic juices were absent and only the succus entericus remained to protect the jejunal mucosa, this 100% incidence of ulcer formation indicates that the latter alkaline juice has little or no protective influence in the prevention of jejunal ulcers.

A comparison of the results obtained in the 4 groups of experiments is illustrated graphically in Fig. 1. These results seem to justify the following conclusions: (1) Of all the constituents of the alkaline duodenal juices bile has the most significant and effective influence in preventing the formation of jejunal ulcers; (2) the pancreatic juice is next most protective; and (3) the duodenal secretion, the succus entericus, has little or no protective influence in the prevention of jejunal ulcers.