

Intracavitary Visceral Radiation: Effect on Gastric Acid Secretion. (18086)

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A transient depression of gastric function has been noted following administration of large doses of radioactive iodine for thyroid carcinoma(1). This observation suggested the possibility that a reduction in gastric acid secretion might be achieved by radiation of the parietal cells from a radioactive isotope placed within the stomach cavity in such a manner as to preclude absorption.

Since 1917 various workers [listed by Palmer(2)] have used roentgen rays to reduce gastric acidity in treatment of peptic ulcer. Palmer's group have reported favorably from their extensive experience with its use(3-6). The chief disadvantage of roentgen radiation is the considerable radiation received by tis-

sues other than the target tissue during the course of treatment.

In attempting to apply radiation from radioisotopes to the gastric mucosa the use of a balloon powdered on the inside surface with radioactive dust was considered but technical difficulties in the safe preparation and manipulation of such a device led to the development of a modification permitting use of the radioactive isotope in solution. It was first planned to distend the bag within the stomach by introduction of radioactive solution but the dangers in handling the large volume of solution required, particularly since beta rays only reach the mucosa from the 2-3 mm of solution closest to the stomach

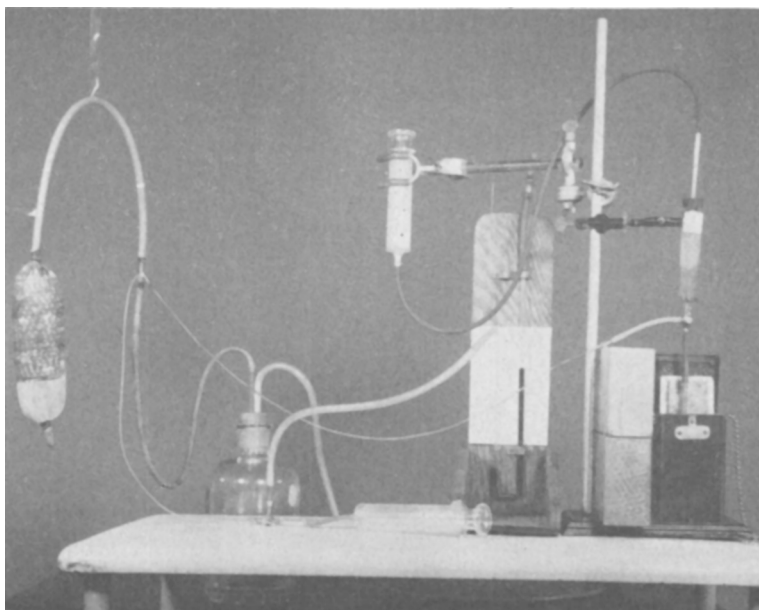


FIG. 1.
The assembled apparatus.

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1. Trunnell, J. B., Brookhaven Conf. Report. Radioiodine, p. 113, 1948.

2. Palmer, W. L., and Templeton, F. E., *J.A.M.A.*, 1939, v112, 1429.

3. Ricketts, W. E., *et al.*, *Ann. Int. Med.*, 1949, v30, 24.

4. Idem, *Gastroenterology*, 1948, v11, 789.

5. Idem, *Gastroenterology*, 1948, v11, 807.

6. Idem, *Gastroenterology*, 1948, v11, 818.

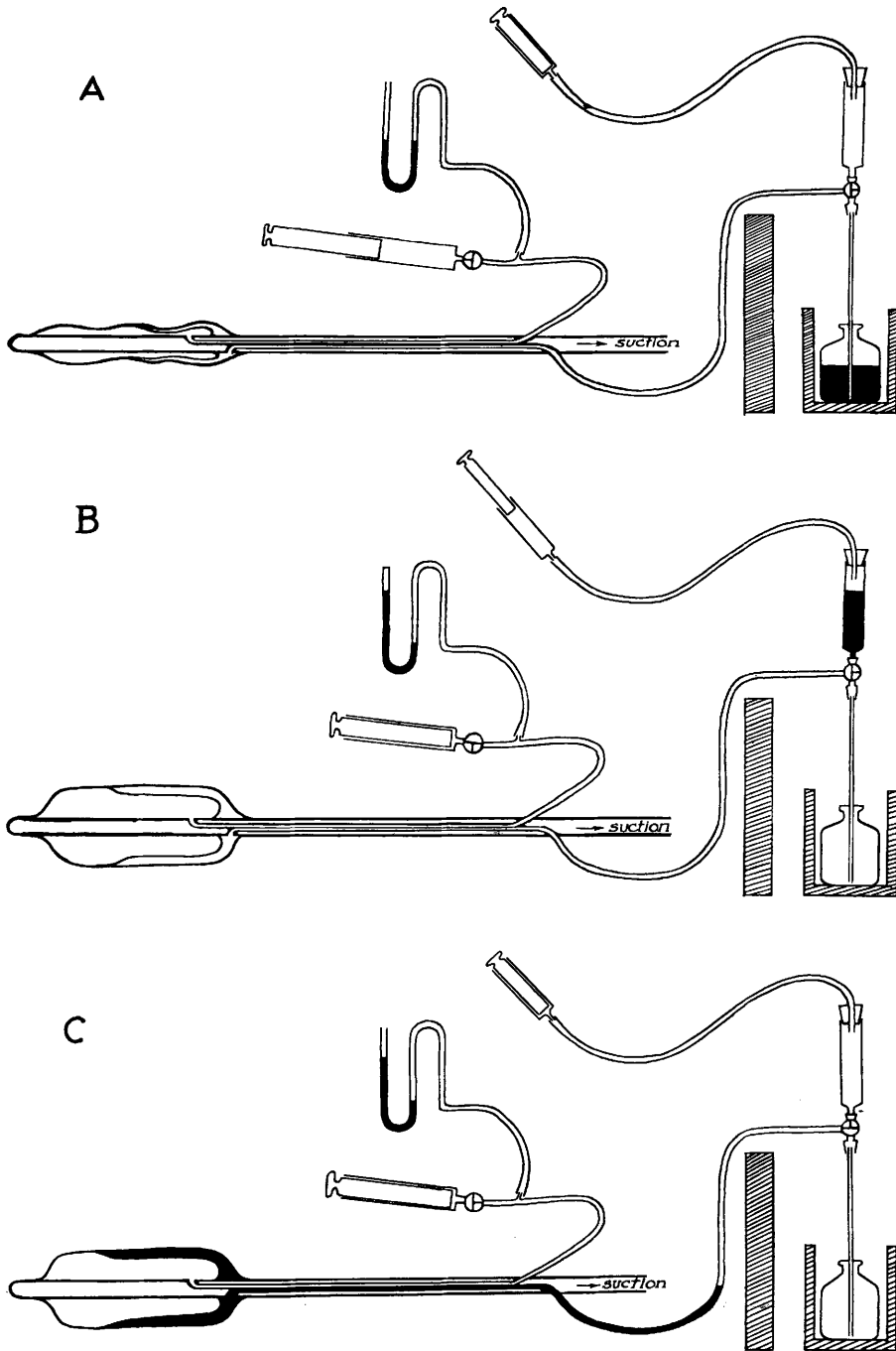


FIG. 2, A, B, C. Procedure for inflation of intra-gastric bag, and introduction of radio-isotope solution into the intermural compartment.

wall, led to further modification of the apparatus. A double-walled bag was constructed with an intermural compartment of small

capacity (10-12 cc). The latter feature was achieved by fastening the two layers of rubber together by dots of cement so arranged

that there was about one dot per square centimeter on the distended bag. Thus, the proximal 2/3 of the wall of the bag (that part in contact with the acid-bearing segment of stomach) forms a miniature air mattress into which radioactive solution can be introduced through a fine plastic catheter after the bag has been placed and inflated with air.

It would be expected that almost any isotope emitting predominantly high-energy beta rays would be suitable for use. However, radioactive iodine has particular advantages: (1) it is probably the most extensively used and widely available isotope in clinical practice; (2) I^{131} emits beta rays of fairly high energy; (3) a unique property is that the uptake of I^{131} by the body can be largely blocked by pre-treatment of the subject with an anti-thyroid drug. The latter is of practical importance in that spillage of radioactive material from accidental rupture of the bag might be catastrophic if the isotope was freely absorbed and persistently retained. As a further safeguard against such an eventuality, the apparatus has been so arranged as to permit constant suction through the tip of the gastric tube distal to the bag.

The apparatus in its present form is depicted in Fig. 1 and 2. Specially prepared adapters (Fig. 3) fastened into a gastric aspiration tube (Davo 728) permit the entry and exit of 2 fine plastic catheters. One catheter communicates with the interior compartment of the bag, permitting it to be inflated after introduction into the stomach. The function of the manometer on this line is to signal the possible occurrence of rupture of the bag. The other catheter communicates with the intermural compartment and permits introduction and withdrawal of radioactive solution by remote manipulation of a syringe.

Applications of the technic. To date, use of the apparatus has been limited to irradiation of the stomach of experimental animals. Achlorhydria has been successfully induced in several dogs without evident damage to the general health of the animals. Experiments are continuing to determine the required dosage of radiation, the duration of

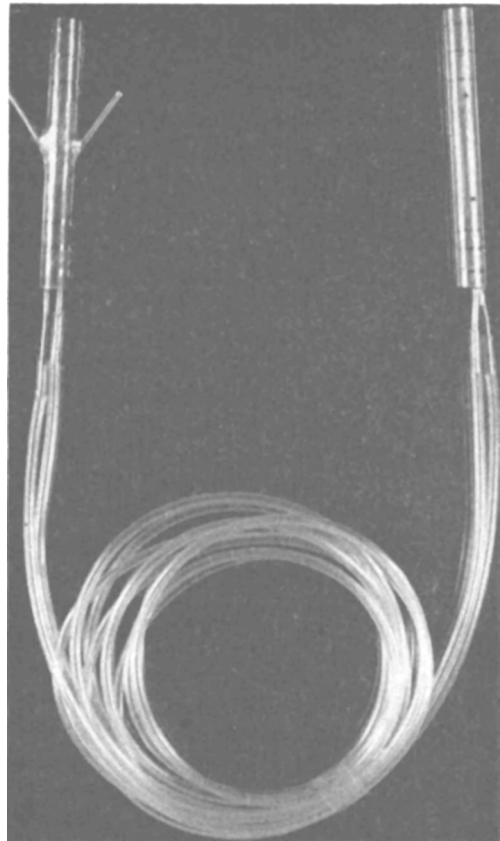


FIG. 3.

Detail of metal adapters and plastic connecting tubes placed within the lumen of the gastric tube.

the achlorhydria induced and to correlate the histologic appearances of serial gastric biopsies with the changes in hydrochloric acid secretion.

Summary. An apparatus has been described permitting intracavitary radiation of hollow viscera accessible to intubation. In preliminary trials the technic has been used to induce achlorhydria in the stomach of dogs. This technic may have additional practical applications for lesions in the rectum, bladder, bronchi and other organs or tracts accessible to intubation.

The valuable suggestions of Dr. A. C. Corcoran and Dr. Otto Glasser, and the technical assistance of Dr. C. Ballinger are gratefully acknowledged. Assistance in fabrication of the intragastric bag was provided by the American Anode, Inc., Akron, Ohio.

Received June 20, 1950. P.S.E.B.M., 1950, v75.