

Esophagostomy in the Dog Allowing Natural Feeding. (23809)

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Esophagostomy and gastric fistula, introduced by Pavlov and Shumov-Simanovski(1) in 1890, has proved a useful preparation for the study of many aspects of gastric physiology, particularly since the introduction of a safe two-stage esophagostomy(2). However, the classical double-barrelled cervical esophagostomy makes the animal entirely dependent for survival on the care given it, and the difficulties encountered in maintaining the animal in a reasonably good general condition have proved a deterrent to the more widespread application of esophagostomy in experimental physiology. The present report proposes an esophagostomy designed to make the animal self-sufficient with regard to feeding and thus overcome the major difficulty of maintenance.

Technic. Esophagostomy is carried out in 2 stages. In the first stage the esophagus is exposed as described previously(2). The animal is anesthetized, and under strict asepsis a left antero-lateral cervical skin incision is made to extend longitudinally from level of cricoid cartilage to within 2 cm of suprasternal notch. The incision is deepened to pass between sternohyoid and sternothyroid muscles medially, and sternomastoid laterally. The deep cervical fascia is split, and the esophagus exposed after retracting the recurrent laryngeal nerve and sternohyoid and sternothyroid muscles medially, and the carotid sheath and overlying sternomastoid laterally. The rather well formed fascial layer investing the esophagus is opened along the length of skin incision. Localization and subsequent manipulation of esophagus is facilitated by intubation of esophagus with fairly rigid rubber or cardboard tube before surgery. The anterior and lateral aspects of esophagus are cleared by blunt dissection from its investing fascia; dorsal attachments, however, are left intact. Blood and nerve supply to exposed portion of esophagus are disturbed as little as possible. Two rows of interrupted stitches are inserted, a deep row to anchor the esophagus to the

strap muscles and platysma, and a superficial one to exteriorize a 7-10 mm wide strip of anterior esophagus by suturing the superior, inferior and lateral aspects of esophageal muscularis to corium of the skin. It is essential to avoid penetration of the esophageal mucosa with these sutures. The esophageal tube is removed and the wound sealed with colloidion. Penicillin and streptomycin may be administered for 2 days postoperatively. The second stage may be performed with safety any time after 4 days, but the most satisfactory period is probably between tenth and fourteenth day. The animal is anesthetized and the esophagus again intubated. Surgical asepsis is advisable but not essential during this stage. The skin incision is freshened and a 3 cm longitudinal incision is made through all layers of the exteriorized anterior esophageal wall. Esophagostomy is rendered permanently patent by suturing the muscularis and mucosa of esophagus to the skin. The esophageal tube is removed. Antibiotics may again be given for 2 days. Esophagostomy may shrink with time, but should this occur, it can be extended to the required length by incising upper and/or lower ends and suturing the incised esophageal and skin margins. This procedure can be carried out without anesthesia or aseptic precautions if the incision is limited to the scar in the skin and esophagus.

Effective separation of the lower from the upper portions of the esophagus for experimental purposes is achieved by forming a temporary flap of esophageal mucosa and bringing it out through the esophagostomy. This is done simply by attaching 2 or 3 small hemostats to posterior and lateral aspects of the esophageal mucosa at level of lower end of the esophagostomy. The weight of the hemostats is sufficient to evert the esophageal mucosa, and the preparation now assumes the advantages of the standard double-barrelled type of experimental esophagostomy. The application of hemostats for several hours twice weekly has not caused lasting compression in-

jury of the esophageal mucosa.

Discussion. This two-stage esophagostomy is a safe operative procedure, and the animals have been found to satisfy their nutritional requirements by the natural processes of eating and drinking. 70-90% of food swallowed passes directly into the stomach, and the portion which escapes through the esophagostomy, if accessible to the animal, may be eventually consumed.

Four dogs equipped with this type of esophagostomy have been maintained in good general condition for more than a year, and the time spent on their care was hardly greater than that required for dogs without esophagostomy. The 3 cm esophagostomy was small enough to make the animal self-sufficient with regard to feeding, and large enough to permit satisfactory eversion of a flap of esophageal mucosa in experiments requiring the exclusion of saliva from gastric secretions. It is of interest that duodenal reflux, as evidenced by the appearance of bile in the gastric collection, was very infrequent in all our preparations with a gastric fistula placed on the most dependent part of the anterior surface of the body.

In our experience, gastric fistula supplemented with the described esophagostomy provides the simplest and most satisfactory preparation for the collection of gastric secre-

tion free of salivary contamination, and is eminently suitable for the study of secretagogue or inhibitory activities of various substances administered parenterally. This type of esophagostomy may also be utilized for mild or moderate stimulation of the cephalic phase of gastric secretion by "limited" sham feeding, a procedure whereby the animal is fed for a few minutes with small single strips of meat. The preparation, however, is less suitable for maximal cephalic phase responses by prolonged unrestricted sham feeding. The latter may be associated with esophageal movements sufficiently violent to retract the everted mucosal flap through the esophagostomy, and thus allow the passage of small amounts of food into the lower esophagus and stomach.

Summary. A safe two-stage operative technique is described for establishing an esophagostomy in the dog which permits natural feeding. When required for experimental purposes, a simple procedure allows this esophagostomy to assume, temporarily, the advantages of the standard double-barrelled esophagostomy.

1. Pavlov, I. P., Shumov-Simanovski, E. O., *Vratch*, Number 41, 1890 (Russian).

2. Komarov, S. A., *Pflügers Arch.*, 1926, v212, 212.

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Production of Antibodies by Adult Hen Spleen Cells Transferred to Chick Embryos.* (23810)

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It is generally accepted that the chick embryo is incapable of producing antibodies(1). A wide variety of cells and tissues have been successfully grafted onto the chorioallantoic membrane (CAM) of the developing chick

embryo. The purpose of the work reported here was to determine whether, and under what conditions, adult hen spleen cells, transferred to CAM, would produce antibodies.

Materials and methods. In all experiments Wynhamp or New Hampshire Red hens (ca 2 kg) were used as donors. Bovine serum albumin (BSA), Armour's Fraction V, in Hanks or in phosphate buffered (pH 6.4) saline solution (PBS), was the antigen used. The donor hens were killed by decapitation and the

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