In support of this hypothesis we have the results of Eccles and O'Connor[7] who have localized the effects of curare and eserine in relation with the action potentials of the terminal plate. As these potentials may not be entirely localized to the histological terminal plate (Feng[8]), it would not be surprising that a chemical or physico-chemical change of the effector might modify the effect of these drugs.

The fact that the arthritic muscle shows a post-tetanic effect and the tenotomized muscle usually does not, may mean that in the latter the synaptic alteration is quantitatively greater.

7 Eccles, J. C., and O'Connor, W. C., *J. Physiol.*, 1939, **77**, 44.

8 Feng, T. P., *Biol. Symposia*, The Jaques Cattell Press, Lancaster, Pa., 1941, **3**, 121.

Summary. We have studied in cats the effect of an atrophy of the soleus and tibialis anticus, caused by an arthritis of the tibiotarsal joint, on some aspects of the synaptic transmission in those muscles.

1. The third stage of the neuromuscular transmission is different in the normal and arthritic muscles. Section A, fig. 1 and 2.

2. The atrophic muscle is more resistant to curarization. Section C, fig. 3.

3. Prostigmine, with the same dosage and frequency of stimulation, produces less potentiation and more depression in the arthritic than in normal muscles.

4. The synaptic behavior of the arthritic muscle is similar to the behavior of the tenotomized, immobilized, and fatigued (4th stage) muscles. The possible significance of such similarity is discussed.

15040

Billroth I, Gastric Resection: Extent Necessary to Protect Against Histamine-Provoked Ulcer.*

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It has been shown in this clinic that a short afferent duodenal loop is an important component of a satisfactory operation when gastric resection on the Billroth II plan of operation is applied to ulcer.[1] It has been shown also that another criterion of a successful operation for ulcer is an extensive gastric resection (75%).[2,3] Inasmuch as the short afferent duodenojejunal loop is so important, the question arose whether it would be equally as satisfactory to sacrifice less stomach (25 or 50%), but to effect gastrointestinal continuity by end to end suture between the stomach and the duodenum by the Billroth I operation. It is the purpose of this report to indicate our observations and experiences with this plan of procedure on the dog, and to note whether the Billroth I plan of performing gastric resection will protect against the histamine-in-beeswax provoked ulcer with excision of less stomach tissue than in the Billroth II operation.

Method. These experiments were carried

* Supported by special grants for surgical research from the following sources: Citizen's Aid Society, Augustus L. Searle, Dr. and Mrs. Harry B. Zimmerman, the Dr. Berenice Moriarity, the Robert A. Cooper Funds, and a grant from the Graduate School of the University of Minnesota.

1 Merendino, K. A., Lannin, B. C., Kolouch, F., Jr., Baronofsky, I., Litow, S. S., and Wangensteen, O. H., PROC. SOC. EXP. BIOL. AND MED., 1945, **58**, 226.

2 Wangensteen, O. H., and Lannin, B. G., *Arch. Surg.*, 1942, **44**, 489.

3 Lannin, B. G., Hay, L. J., Judd, E. S., Jr., and Wangensteen, O. H., PROC. SOC. EXP. BIOL. AND MED., 1944, **56**, 231.

out on 12 dogs in 3 series. Each series had a different amount of stomach resected, but the residual gastric pouch in each dog in all series was anastomosed to the duodenum just beyond the inverted duodenal end by means of an end-to-side gastroduodenostomy. This procedure, known as the Billroth I-Von Haberer plan of operation, is technically more feasible in the dog than the straightforward Billroth I operation which requires an end-to-end gastroduodenostomy. After an interval averaging 46 days, the administration of 30 mg of the histamine-in-beeswax mixture, prepared after the method of Code and Varco,[4] was injected intramuscularly each evening, following which the dogs' feed pans were removed and no more food given until the following morning. Unless the dogs succumbed from the complications of ulcer invoked by the histamine implantation, the injections were carried out for 45 days.

Operative Procedure. The dogs were anesthetized with intravenous nembutal, 15 mg per pound. Anesthesia was continued with intratracheal ether. Continuous gastric suction was applied during and immediately after surgery. Under aseptic conditions, a midline incision was made. The duodenum was transected and inverted immediately distal to the pyloric sphincter. The required amount of stomach was resected, the Hofmeister procedure being used on the lesser curvature side. Continuity of the intestinal tract was completed by an end-to-side aseptic gastroduodenostomy just beyond the inverted duodenal end. The abdomen was then closed.

Post-operatively, the dogs were fed parenterally for 72 hours, with 10% glucose in saline solution containing some isotonic gelatine in saline solution. After 72 hours water was allowed, and the diet gradually increased thereafter, until in one week the regular diet of tablescraps, horsemeat, and kibbles was tolerated. This was reinforced with vitamins A, B, C, and D.

Experiments. Series I. Four dogs were used. A 25% gastric resection and gastroduodenostomy was performed at the inverted duodenal end. After a sufficient recovery period from the operation, the daily administration of the histamine-in-beeswax mixture was begun.

Series II. The identical procedure was used on 4 dogs in this series with one difference: a 50% gastric resection was carried out, followed after a suitable interval by the administration of histamine.

Series III. In this series a three-quarter gastric resection (75%) was done, followed subsequently by the administration of histamine.

Results. The incidence of stomal ulcer attending the 25, 50, and 75% gastric resection carried out in the Billroth I plan of operation, followed by the administration of histamine, is shown in Table I. In both Series I (25% gastric resection) and in Series II (50% gastric resection) stomal ulcer was observed in 3 out of the 4 dogs in each series. In Series III (75% gastric resection) stomal ulcer was not observed.

Discussion. It would appear from these experiments that just as large a gastric resection is necessary in the Billroth I plan of operation to protect against stomal ulcer, as in the Billroth II operation. Whereas a short afferent duodenojejunal loop is an essential component of a satisfactory operation for ulcer, the factor of a short afferent loop alone cannot supplant extensive gastric resection. It is in the employment of all the criteria of a satisfactory operation for ulcer as described elsewhere[2,3] that one may obtain results that will be consistently good. The Billroth I plan of operation for ulcer, with a three-quarter gastric resection (75%), is technically a more difficult procedure than a similar resection in which a short afferent duodenojejunal loop is employed in a retrocolic anastomosis made at the ligament of Treitz (Billroth II). The latter operation has been employed in this clinic in the surgical management of ulcer for several years.

Conclusions. Small gastric resections (25 and 50%) in dogs, when accompanied by no afferent loop (Billroth I), are accompanied by a high incidence of histamine invoked stomal ulcer. When a three-quarter gastric resection (75%) is done, however, stomal ulcer cannot be produced with histamine.

[4] Code, C. F., and Varco, R. L., PROC. SOC. EXP. BIOL. AND MED., 1940, **44**, 475.

TABLE I.
Occurrence of Stomal Ulcer Accompanying Gastric Resection of Variable Sizes (25, 50, and 75%) Carried Out on the Billroth I Plan of Operation After Administration of Histamine-in-Beeswax.

Dog No.	Wt, lb	Survival, days	Results
		Series I—25% Gastric Resection.	
356	72¼	16	4 large duodenal ulcers. One perforated.
330	45	45	Small gastric ulcer. Small duodenal erosion.
331	55	45	No ulcer.
394	30	17	2 duodenal ulcers, one perforated.
		Series II—50% Gastric Resection.	
325	45	45	Large duodenal ulcer.
333	40	45	" " "
313	34	45	" " "
262	38	45	No ulcer.
		Series III—75% Gastric Resection.	
328	33	31	No ulcer. Pregnant. Dead of uterine volvulus.
329	44	45	No ulcer
372	42	45	" "
373	55	45	" "

These experiments suggest that it is unlikely that substitution of the Billroth I for the Billroth II plan of operation, in which a short afferent duodenal loop is employed, will protect against recurrent ulcer with less sacrifice of stomach. A three-quarter resection will protect against the histamine-in-beeswax provoked ulcer, whether the operation is carried out on the Billroth I or II plan of operation.

15041

Fate of Intravenously Injected Fat: Its Role in the Production of Ulcer*

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Gastric hemorrhage as a complication of fracture has been observed in patients in this clinic.[1] In a series of 52 dogs subjected to fracture of the humerus, or to a small drill hole placed through both cortices of the humerus or curettage of the bone marrow of the shaft of the humerus after placement of the drill hole, gastroduodenal pathology (erosion and/or ulcer) was demonstrated in 21% of the dogs.[2] In dogs with gastric pouches, such procedures, as well as the intravenous injection of fat, failed to evoke evidence of stimulation of gastric secretion.[3] It was observed however that ulcer could be produced by the intravenous injection of fat, when accompanied by the administration of histamine-in-beeswax.[4] It remained to be shown, however,

* Supported by special grants for surgical research from the following sources: Citizen's Aid Society, Augustus L. Searle, Dr. and Mrs. Harry B. Zimmerman, the Dr. Berenice Moriarity, the Robert A. Cooper Funds, and a grant from the Graduate School of the University of Minnesota.

[1] Wangensteen, O. H., Merendino, K. A., and Litow, S. S., *Bull. Am. Coll. Surg.*, 1945, **30**, 58.

[2] Merendino, K. A., Litow, S. S., Armstrong, W. D., and Wangensteen, O. H., *Bull. Am. Coll. Surg.*, 1945, **30**, 58.

[3] Merendino, K. A., Litow, S. S., and Wangensteen, O. H., *Bull. Am. Coll. Surg.*, 1945, **30**, 58.

[4] Baronofsky, I., and Wangensteen, O. H., *Bull. Am. Coll. Surg.*, 1945, **30**, 59.