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Effect of Previous Ileosigmoidostomy on Survival Period of Dogs with Low Ileal Obstruction.

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Introduction. A correlation of the survival period with the level of simple obstruction has been observed by many investigators. It is well established that dogs with obstruction of the upper jejunum will survive 2-4 days (average), of the lower ileum, 7-8 days (average); when the site of obstruction is the distal colon, the survival period may be as long as 50 days. Length of life thus varies directly with the distance of the site of the obstruction from the pylorus. The principal cause of the rapid death which follows high obstruction is due to changes in blood chemistry incident to dehydration and loss of gastro-intestinal secretions. The cause of death in low ileal obstructions is not so well understood. Elman and Hartmann[1] are of the opinion that in low ileal obstruction, the cause of death is not due to the above factors.

Wangensteen and Leven[2] say that saline does not protect animals with ileal or colonic obstructions. The survival period of dogs with complete ileal obstruction is little greater with subcutaneous saline than without. Carlson's[3] series of dogs with ileal obstruction (given saline) lived 2-14 days.

Procedure and Method. In an attempt to correlate the cause of death and survival period of ileal obstruction with the function of the bowel, the following experiments were undertaken. Ileosigmoidostomy was performed in 7 dogs, short circuiting almost the entire colon, in an effort to adapt the ileum to the function of the colon.

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[1] *Surg. Gynec. and Obst.*, 1931, **53**, 307.

[2] *Arch. Surg.*, 1931, **22**, 658.

[3] PROC. SOC. EXP. BIOL. AND MED., 1932, **29**, 421.

These dogs developed a transient diarrhea of 2 or 3 weeks' duration, which finally subsided with a return to previous body weight and normal bowel habits. After varying periods of time (2-8½ months) the dogs were operated upon again, the anastomosis taken down and obstruction of the terminal ileum produced in the usual manner (inversion of ends). Two of the obstructed animals were allowed to go without saline. The remainder received daily 500 cc. of normal saline subcutaneously. The blood chemistries (non-protein nitrogen, urea and chlorides) were determined every other day.

Results. Two dogs (without benefit of saline) lived 8 and 10 days respectively and lost approximately 17% body weight before death. They had had ileocolostomy only 2 months previous to obstruction. Of the 5 remaining animals (with benefit of saline) 2 lived 10 and 12 days losing 7.0 and 14.8% of body weight respectively. The last 3 dogs survived for 25, 31, and 34 days with a loss of from 28 to 40% of body weight before death. All showed a moderate fall of blood chlorides (only one below 300 mg.) and a gradual elevation of non-protein nitrogen and urea. The chemistry changes were most marked in the animals with the shortest survival periods. Five of the dogs died of the obstruction *per se;* one developed a volvulus above the site of obstruction, and the other a localized abscess from perforation of colon at the site of previous anastomosis.

Progressive distension was a prominent feature, especially in those dogs surviving 25, 31, and 34 days. In these, the bowel just above the site of the obstruction measured 8-10 cm. in diameter, about 4 times the normal. Gross areas of congestion and hemorrhagic changes in the mucosa were present on the antimesenteric border of the bowel. Microscopically these areas showed hemorrhagic necrosis of the mucosa. In one, Dog No. 70, several small areas of mucosal ulceration were evident.

Discussion. Ileosigmoidostomy was performed in 7 dogs to alter the function of the terminal ileum by adapting it to conditions of the colon, *i. e.,* (1) stasis, (2) absorption of water, and (3) bacterial flora. After 2-8½ months simple ileal obstruction was produced at the site of the anastomosis. Three of the dogs survived for 25, 31, and 34 days. This survival period is considerably longer than that of dogs with similar low ileal obstruction. A loss of 28 to 40% of body weight occurred in these 3 dogs before death. Death was due largely to starvation. Ileal obstruction on these dogs simulated large bowel obstruction, *i. e.,* distension, loss of weight, starvation, and increased survival period. This can best be explained as follows:

SUMMARY: ILEOSIGMOIDOSTOMY SERIES

Dog	Duration ileoco-lostomy	Survival period after obstruction		Weight loss	Chemistry limits			Chemistry at death			Pathology
	mo.	days	saline given	%							
37	2	8	No	17.6	Cl.	412		412			Distension and ruber of bowel wall
					U.		35.		35.		
29	2	10	No	17.	Cl.	305		305			Abscess about colon closure
					U.		33.		33.		
					NPN		65.			65.	
45	3½	12	Yes	14.8	Cl.	264		264			Volvulus, segment of small bowel with strangulation
					U.		18.		18.8		
					NPN		107.0			37.2	
79	6	10	Yes	7.	Cl.	379		379			Hemorrhagic necrosis, antimesenteric border
					U.		150.		50.		
					NPN		214.			80.	
71	3½	25	Yes	28.	Cl.	330		346			Hemorrhagic areas of necrosis, antimesenteric border.
					U.		21.4		11.5		
					NPN		47.			22.5	
70	8	34	Yes	29.	Cl.	313		346			Closed loop formed by adhesions; hemorrhagic necrosis, antimesenteric border; ulceration of mucosa
					NPN		42.			37.	
74	8½	31	Yes	40.	Cl.	363		478			Hemorrhagic necrosis, antimesenteric border
					NPN		40.			30.	

The ileum after ileosigmoidostomy gradually accommodates itself to conditions of the colon, *i. e.,* (1) stasis; (2) greater bacterial flora; and (3) takes over its function of absorption of water. Upon the establishment of the obstruction, these functions which would then be lost to the organism because of exclusion of the colon (below obstruction) are preserved.

Conclusions. 1. Preliminary ileosigmoidostomy results in increased survival period following establishment of low ileal obstruction. 2. Adaptation of the ileum to conditions of the colon preliminary to obstruction results in increase of functional length with subsequent increased survival period. 3. The lethal factors in low ileal obstructions, although not well understood are apparently dependent upon some peculiarity or alteration of function of the bowel above the level of obstruction.