

STUDY OF GASTRIC SECRETORY ACTIVITY AND HISTOLOGY OF STOMACH IN PYLORUS OBSTRUCTED DOGS WITH REFERENCE TO HORMONES

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That there were a number of functional alterations with the changes in histology of the stomach, was stated for the first time by Babkin, (2) and this remained as an unexplained phenomenon for a considerable period. Changes in the physiology of the rat gastric mucosa, resultant to congestion and breakdown, led to demonstrable structural changes. (16). However no clear relationship between such changes and functional activity could be established.

It has been shown that there was a continuous increase of gastric secretion and acidity, but marked ulceration did not take place if feed was given. (19). They concluded that probably acidity and peptic activity were utilized in the process of digestion and there was no excess left to cause ulceration.

Improvement in gastric ulceration after the administration of 5 mgm stilboesterol has been reported by Ojha, & Venkatachalam, (15) while the influence of sex hormones on experimentally produced gastric ulceration has been reported by Antonsen., (1). He has shown that ulceration was more severe in intact than ovariectomized rats. He further showed that injection of Oestradiol in castrated male rats caused a high incidence of ulceration than in control animals.

Little information is available in the literature pertaining to the effect of endocrine gland secretion on gastric mucosa in pylorus obstructed dogs. The present study has been undertaken to study the histology of gastric mucosa and its secretory activity in pylorus obstructed dogs after administration of some hormones namely.—Testosterone propionate, Pituitrin and Stiboesterol.

METHOD & MATERIAL

All experiments were carried out on dogs of both sexes with an average weight between 12 to 13 Kgms. Dogs were cleaned with antiseptics, kept under proper supervision and fed on a standard diet. (consisting of Milk, chapaties and Meat) After a week when dogs became docile, they were operated upon under chloralose anaesthesia (90 mgm per Kgm body weight/I.V.) for gastrojejunostomy, pyloric occlusion and gastric pouch making. The pouches were made surgically according to the technique of Nasset and Tompson. (18).

Gastric juice was collected from the exteriorized stainless steel canula in a polythene bottle attached to it underneath a metal frame work on which experimental dogs

were specially mounted at a stipulated time. The juice was collected at half-hourly interval for a period of three hours. The collected juice was centrifuged and the supernatant measured and analysed for its free acid and total acid contents. The pH values were also determined. Biochemical estimations were carried out by a standard-technique mentioned in Hawk's Physiological Chemistry, (8) The analyses were carried out in each case for a stipulated number of days and then the dogs were sacrificed and autopsies performed. Pieces from the pyloric and fundal region were taken and studied histologically after staining them with haemotoxylin and eosin. Cytological studies of the mucus cells were also carried out. Analysis of the juice was done for three consecutive days in two and six consecutive days in two dogs and five consecutive days in one dog. Two dogs were studied with out pyloric occlusion and served as control. The effect of drugs namely Testosterone propionate (25 mgm I.M.), Stilboesterol (5 mgm I.M.) and Pituitrin (10 I.U. I.M.) were noted, after the administration of the respective drugs for seven days prior to operation all the period subsequent to operation till animals were sacrificed.

RESULTS

It is clear from our experimental data that all cases of pyloric obstruction show a similar pattern of results indicating that pyloric obstruction caused an increase in gastric secretion which increased with the period of obstruction. The average three hourly secretory volume did not vary significantly on any day. In pylorus obstructed dogs, there was not only an overall increase in the secretory volume but also an average daily increase of 21.5 cc in volume. Free acid showed an average increase of 0.3959% and total acid of 0.4440% with consequent fall in pH (Table A). Ulceration was not present. However some amount of congestion and oedema of the submucosa with polymorphonuclear cells and infiltration of the submucosa and mucosa were present, specially in those

(TABLE 'A')

Average values of volumes, pH, free acid and total acid contents in 3 hours

Day	Control dogs				Pylorus Obstructed dogs			
	pH	Volumes in ccs.	Free Acidity per cent	Total Acidity per cent	Volume in ccs.	Free Acidity per cent	Total Acidity per cent	pH
2nd	2	23.3	0.2570	0.3734	37.8	0.5127	0.7177	1.5
3rd	2	22.6	0.2756	0.3859	42.4	0.6449	0.7934	1.0
4th	2	22.8	0.2856	0.3902	42.6	0.6608	0.8102	1.0
5th	2	20.6	0.3009	0.4063	45.8	0.7448	0.8775	below 1
6th	2	21.6	0.3000	0.4011	46.3	0.7642	0.8840	below 1
7th	2	17.9	0.3027	0.4015	43.5	0.7689	0.8888	below 1

dogs which were sacrificed in the later stage. (Fig. 2). The cytological studies showed normal parietal and mucus cells (Fig. 1).

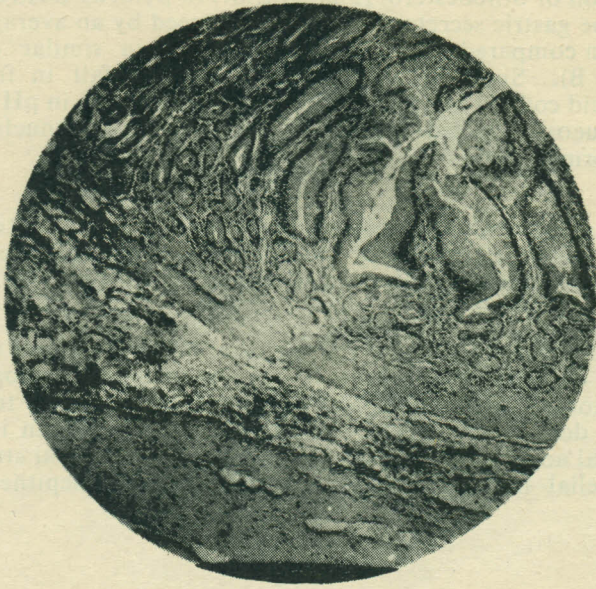


Fig. 1. Normal Gastric Mucosa.

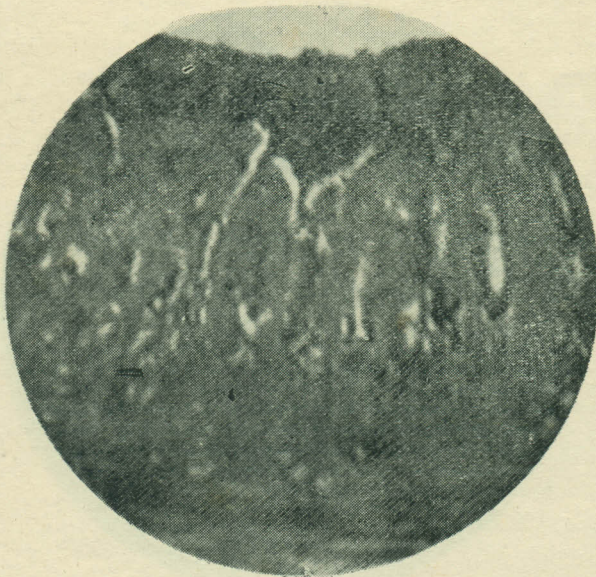


Fig. 2. Showing changes in Gastric wall after Pyloric Obstruction. Infiltration of mucous and submucous layers with Polymorphe nuclear leucocytes. The mucous cells are normal.

Administration of Stilboesterol (5 mgm I.M.) in pylorus obstructed dog resulted in diminution of the gastric secretory activity as evinced by an average daily decrease in volume of 18 cc when compared to the values obtained in similar dogs not receiving Stilboesterol. (Table B). Similarly there was an average fall in free acid content by 0.3412% and total acid content by 0.3861%. A consequent rise in pH also occurred. The study of gastric mucosa showed infiltration with polymorphonuclear leucocytes and other layers were normal, (Fig. 4).

The pylorus obstructed dogs receiving Testosterone Propionate did not show any noticeable change in secretory process or ulcer formation. Histological studies however showed congestion, oedema and infiltration of mucus layers (Fig. 3).

The administration of Pituitrin in pylorus obstructed dogs did not produce any appreciable change either in the secretory volume or in its histology. The volume of secretion, free and total acid contents and pH values are similar to that obtained in pylorus obstructed dogs only. (Table B), showing there by an increase in secretory volume, free and total acid contents and a fall in pH. Histological studies, revealed discontinuity of epithelial lining in the pyloric region with subepithelial infiltration with

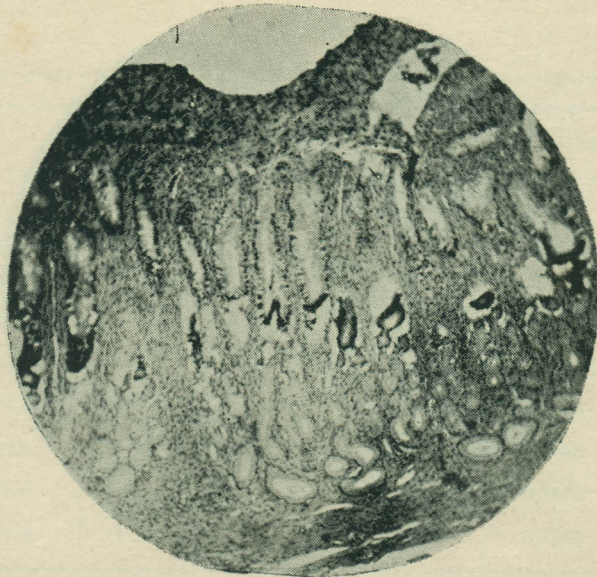


Fig. 3. Effect of Testosterone (25 mgm I.M.) on Pyloric obstruction. Infiltration of superficial layers with polymorphonuclear leucocytes. (H. & E.)

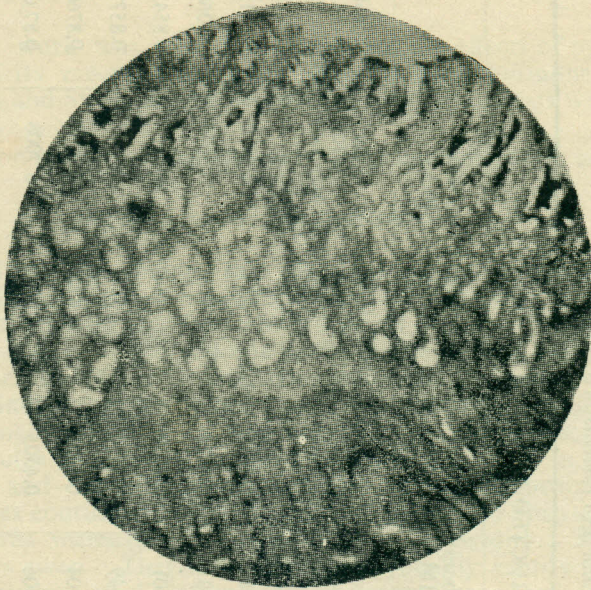


Fig. 4. Effect of Stilboestrol (5 mgm. I.M.) on pyloric obstruction. No appreciable change. (H. & E.) polymorphonuclear leucocytes. The submucosa was oedematous and infiltrated with polymorphs and the other layers were normal (Fig. 5).

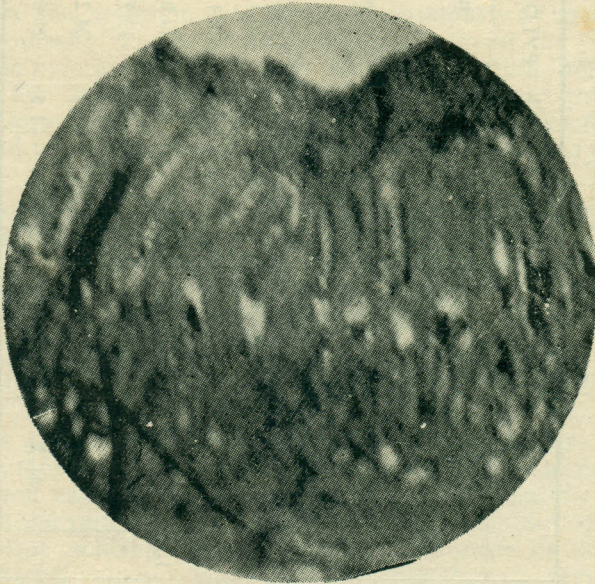


Fig. 5. Effect of Pituitrin (10. I.U.) on pyloric obstruction. Mucous cells normal. Infiltration of superficial layers with polymorphonuclear leucocytes.

(TABLE 'B')

Average values of volume, pH, free and acid total acid contents in 3 hours

Days	PYLORUS OBSTRUCTED DOGS											
	Effect of Testosterone Propionate (25 mg. IM)				Effect of Stilboestrol 5 mg. IM				Effect of Pituitrin (10 I.*U. I.M.)			
	pH	Volume in ccs.	Free Acid per cent	Total Acid per cent	pH	Volume in ccs.	Free Acid per cent	Total Acid per cent	pH	Volume in ccs.	Free Acid per cent	Total Acid per cent
2nd	1.5	32.3	0.4881	0.7045	1.5	26.1	0.3482	0.4488	1.5	35.2	0.4472	0.6413
3rd	1.0	38.1	0.6434	0.7206	1.5	28.1	0.3531	0.4471	1.5	41.3	0.5673	0.7060
4th	1.0	37.1	0.6758	0.7191	1.5	22.6	0.3401	0.4159	*	44.7	0.6837	0.8542
5th	*	41.9	0.7347	0.7804	1.5	23.3	0.3449	0.4572	*	42.0	0.6937	0.8577
6th	*	40.7	0.7454	0.7761	1.5	24.2	0.3304	0.4456	*	42.2	0.6968	0.8760
7th	*	41.7	0.7349	0.7845	1.5	25.6	0.3406	0.4505	*	35.4	0.7008	0.8738

* = below 1.

DISCUSSION

The present work was aimed at observing the effects of pyloric obstruction on gastric secretion and its mucus membrane. The effect of hormones like Testosterone Propionate, Pituitrin and Stillboesterol on pylorus obstructed dogs was also studied.

The discussion of the findings has been done under seperate headings.

PYLORIC OBSTRUCTION

It is clear from our findings that all cases of pyloric obstruction show a close similarity of results indicating that it causes an increase in gastric secretory volume, free and total acid contents with a consequent fall in pH. (Table A). There is no evidence of ulceration which could be attributed due to the pressence and digestion of food during the experimental process. However some congestion and oedema of the submucosa with polymorphonuclear infiltration was noted specially in those dogs which were sacrificed in later stages. Cytological studies showed normal parietal and mucus cells. Seperation of pepsinogen granules was present. The present findings are in accord with those of Singh, *et al.*, (19) and Leeven and Hallinger (12). According to Singh *et al.*, the digestive processes continued to function inspite of pyloric obstruction. In their cases there was a continous increase of gastric secretion and acidity. There was no marked ulceration if food was given. They concluded that probably acidity and peptic activity were utilized in the process of digestion and no excess remained to cause ulceration. In the present series also food was administered through out the period of experimentation and hence ulceration was not present. Leeven & Hallinger (12) also found the absence of ulceration while digestion of food was going on. On the other hand, Donald and Code (15) noted that the volume of gastric secretion and its acidity were different when the secretion was drained continously as against when allowed to accumulate in the stomach. The present investigations reveal the occurence of ulceration commonly in the pyloric region. The possible explanation for this is perhaps that given by Best & Taylor (2a) According to them gastric ulcers in the great majority of cases involve the pyloric part of the stomach specially along lesser curvature because this region is exposed more to the prolonged action of the acidity in gastric contents.

This may appear contradictory because the pyloric region normally secretes a natural or alkaline fluid. But the observations made by Mathew and Dargsted quoted by Best & Taylor (2a) suggest the curious fact that the commonest situation of peptic ulcers of the gastrointestinal tract are not in the mucosa which in itself secretes a natural or alkaline fluid *e.g.*, the pyloric region, duodenal cap, cardiac and oesophagus region.

EFFECT OF STILBOESTEROL ON PYLORIC OBSTRUCTION

The present study observations are more or less similar to those of Ojha, and Venkatachatam, (15). The administration of stilboestrol for a few days before and after pyrolic occlusion caused a retardation in the average secretary volume by 18 cc. when compared with the values obtained for pylorous dogs not receiving stilboestrol. There is a fall in free acid by 0.3412 per cent, total acids by 0.3861 per cent and a consequent rise in the pH values. Study of the mucosa showed very little abnormality. The mucosa showed infiltration with polymorpho nuclear leucosytes only. Nassio (14) demonstrated that oestroge prevented peptic ulceration in castrated animals. Bockus

(3) showed that injection of extracts from urine of pregnant animals prevented production of peptic ulcer in experimental animals. Later Ojha *et al.*, (15) confirmed these findings by reporting the improvement of gastric ulceration after the administration of stilboestrol. Antonsen (1), however, has a different opinion. He noted that the ulceration was more serious in intact than ovariectomised rats. He further found out that injection of oestradiol in castrated male rats caused a high incidence of ulceration than the control group.

The results of the present findings can be explained on the basis of inhibitory influence of oestrogens on adrenals. Adrenal cortical hormone may have some role in the enhancement of the ulceration and when this is inhibited by oestrogen, the ulcerative process is stopped.

EFFECT OF TESTOSTERONE PROPIONATE

On Pyloric Obstruction

The present study does not show any noticeable change on secretory activity when compared to those experimental dogs not receiving testosterone. There was a daily increase in the secretory volume, free and total acid contents. The pH values registered a fall. (Table B). Histological studies revealed similar pattern as that obtained in pylorus obstructed dogs only. These findings are in agreement with the observations of Antonsen (1), Gray and Ramsay (7) who observed that there was no appreciable difference in gastric secretion between intact and orchidectomized rats. Singh (17) also is of the same opinion. He showed that orchidectomy does not influence either gastric secretion or the degree of formation of ulcers.

EFFECT OF PITUITRIN (10-I.U.) ON PYLORUS OBSTRUCTED DOGS

Little is known regarding the effect of the posterior pituitary extract in pylorus ligated animals. Ablation studies have shown that the most striking effect of hypophysectomy is the cessation of growth. However not much is known about its involvement in gastrointestinal dysfunction.

Crafts and Walker (4) have demonstrated that pituitary ablation reduces the volume of gastric juice secreted after pyloric ligation. Dodds and Metz showed that pituitary extract caused a marked reduction in hydrochloric acid of gastric secretion. Pollard (11) found an increase in gastric acidity, unaltered by vagotomy during ACTH administration in animals. French (6) demonstrated maximal response after the subcutaneous administration of ACTH before and after vagotomy. In all these cases the effects obtained must have been due to the influence of anterior pituitary and that too mainly ACTH. Hirchowitz (9) showed that posterior pituitary extract had no influence on secretion of pepsin. The present study shows the pituitrin did not produce any obvious change in either the secretory activity or histological findings of pylorus ligated animals (Fig. 5). The volume of secretion, free acid and total acid and pH values were more or less like those obtained in pylorus obstructed dogs not receiving pituitrin (Table B). The histological findings reveal discontinuity of epithelial lining in the pyloric region with sub-epithelial infiltration with polymorpho nuclear leucocytes. The sub-mucosa was oedematous and infiltrated with some amount of polymorphs (Fig. 5).

CONCLUSION

The following conclusions have been drawn as a result of the present study.

1. Pylorous obstructed dogs showed an increase in the volume of secretion, free and total acid contents and a fall in the pH values.
2. Ulcerative changes were noted in the pyloric region in prolonged cases of obstruction.
3. Administration of stilboestrol caused a retardation in the secretory volume, free and total acid with a consequent rise in pH, in pylorus obstructed dogs.
4. Testosterone does not show any influence of secretory activity and ulcerative process in pylorus obstructed dogs.
5. Pituitrin does not show any effect on the secretory activity or mucous membrane of obstructed dogs.

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