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Symposium on substance P

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1961

B. PERNOW AND S. WALLENSTEN

THE RELATIONSHIP BETWEEN SUBSTANCE P AND THE MOTILITY OF THE SMALL INTESTINE IN MAN

A preliminary report

In the discussion about the physiological significance of SP in the intestinal tract it has been supposed that the substance is in some way related to the intestinal motility, in view of its special appearance in those parts of the gut having the highest degree of motility, and further its powerful stimulating effect on the intestinal smooth muscle. In 1952 Ehrenpreis and Pernow found at least some correlation between the degree of motility and SP concentration in a material of Hirschsprung's disease. Thus it was shown, that the proximal part of the recto-sigmoid, which is neurohistologically quite normal and hyperactive, had a significantly higher SP concentration than the corresponding segment in normal rectum. Furthermore, the distal aperistaltic and aganglionic part of recto-sigmoid in the Hirschsprung series showed much less SP than the control segments.

In the present study we have approached this problem by analyzing pieces of jejunum and ileum for their content in SP, before and after provoked increase in motility.

Procedure. — At abdominal surgery a duodenal catheter was introduced down to jejunum and 150 ml of 50 per cent glucose solution was applied locally. Prior to the glucose administration a small piece of jejunal tissue was taken out. The defect was sutured. The glucose solution was then administered and the resulting change in motility observed. When it reached its peak, usually 4—5 min. after injection, another piece of gut of equal size was excised adjacent to the first.

Extraction method. — The pieces of gut were, immediately after removal, put into acetone and extracted according to Amin, Crawford and Gaddum (1954). The SP activity was assayed on isolated guinea pig ileum in the presence of atropine, Lergigan (antihistamine) and tryptamine. The activity was completely inactivated by trypsin.

Material. — The investigation was carried out in 10 patients who should be operated upon with partial gastrectomy. Another series consisted of 8 patients with dumping syndrome of such a severity that they had to be reoperated upon.

Results. — As is seen in Table I the local administration of glucose in most cases elicited only a slight to moderate motility in jejunum. The SP content of the first piece of gut, taken prior to glucose injection, varied between 9.6 and 37 units per g. The SP content of the second piece of gut did not differ significantly from the first one. In one case (case 1) a lively motility was observed and in this case the SP content of the second piece was 35.0 units per mg compared to 23,6 in the initial one.

TABLE I

EFFECT OF LOCAL GLUCOSE ADMINISTRATION ON INTESTINAL MOTILITY AND SP CONTENT IN PATIENTS WITH DUODENAL ULCER.

Case	Initial P conc. (U./g tissue)	After local administration of 150 ml 50% glucose	
		Motility	SP
1	23.6	Lively	35.0
2	11.7	Slight	10.5
3	13.2	"	8.5
4	37.0	"	30.0
5	16.0	Moderate	8.0
6	26.0	"	28.0
7	9.6	Slight	9.3
11	12.9	"	6.2
12	14.8	"	12.6
13	15.1	Moderate	11.1

In the dumping series (Table II) the local glucose administration initiated in most cases a lively or very lively motility. In those cases a significantly higher SP concentration was obtained in the piece of gut taken after the stimulation as compared to the initial value.

TABLE II

EFFECT OF LOCAL GLUCOSE ADMINISTRATION ON INTESTINAL MOTILITY AND SP CONTENT IN PATIENTS WITH DUMPING SYNDROME.

Case	Initial P conc. (U./g tissue)	After local administration of 150 ml 50% glucose	
		Motility	SP
8	19.7	slight	17.7
9	6.9	very lively	19.8
10	10.6	very lively	13.3
14	4.1	moderate	10.5
15	4.8	very lively	16.9
16	18.4	slight	18.7
17	4.8	very lively	8.0
18	1.3	lively	2.4

All data hitherto obtained are summarized in Fig. 1, where the difference in SP concentration between the second and first pieces of gut is related to the effect in motility obtained by glucose administration.

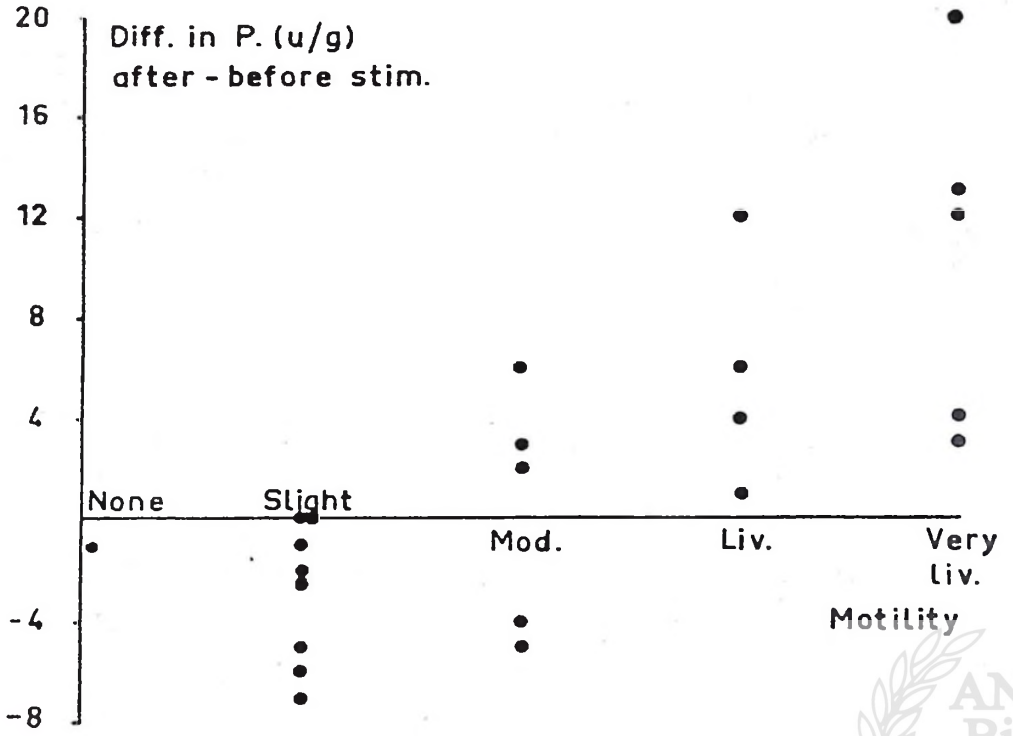

FIG. 1

Difference in substance P concentration (units per g wet tissue) between pieces of human jejunum taken after and before administration of glucose in relation to the degree of motility elicited by the stimulation.

Summary

The substance P content of the intestinal wall in man was studied before and after intraluminar administration of hypertonic glucose. No difference in substance P was obtained in those cases where only a slight increase in the motility was elicited by glucose. In those patients in which the glucose administration caused a marked increase in motility the substance P content of the intestine was higher after glucose then before.

ODNOS IZMEĐU SP I POKRETLJIVOSTI TANKOG CRIJEVA

Proučavao se sadržaj SP u stijenci čovjekovog crijeva prije i poslije intraluminalne aplikacije hipertoničnog rastvora glukoze. U onim slučajevima kad je glukoza izazivala samo slabo pojačanje pokretljivosti nisu zapažene razlike u sadržaju SP. Međutim, kod pacijenata kod kojih je aplikacija glukoze prouzrokovala znatno pojačanje motiliteta nađen je znatniji sadržaj SP poslije primjene glukoze nego prije nje.

REFERENCES

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DISCUSSION

HUKOVIĆ: Have you taken the two pieces of gut at the same time, or have you always taken them after a certain time interval?

PERNOW: I always took them after a time interval.

ZETLER: Does the increase in SP concentration mean that the active principle is either synthesised faster or destroyed more slowly? Do you have any idea about the biochemical mechanism which leads to the change in SP concentration you observed?

PERNOW: Yes, I think an increase in SP concentration is best explained as either a faster synthesis or a slower rate of destruction. But I have no idea which explanation is relevant here.

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