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Intramural ganglia in diverticular disease of the colon

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SYNOPSIS Intramural plexuses were studied in 30 colons, and a plethora of ganglionic tissue was observed in specimens with diverticula when compared with a control series. This alteration in the ganglionic pattern is considered real rather than apparent; the changes are confined to the region of the colon where muscular hypertrophy is present.

The formation of diverticula in the colon suggests that the intraluminal pressure may be raised, and Painter (1963) has induced abnormal pressure patterns with morphia in colons bearing diverticula. The association of muscular hypertrophy with diverticula formation in the colon has been described by Edwards (1939) and Morson (1963), but the fact that muscular hypertrophy may precede the evidence that diverticula are being formed is not universally appreciated. When the abnormality of muscle is studied it may also be seen to involve the colonic wall distal to the area affected by diverticula. These facts stimulated the idea of studying the intramural ganglia in cases with diverticula.

METHOD

Colons resected at operation were distended with 10% formol saline immediately after removal, distension being obtained by gravity, the head of the solution being constant for all specimens. The specimens were subsequently fixed in formol saline before section. When fixed, circumferential sections were cut from three sites: distal to diverticula but where hypertrophy was still evident, where diverticula and muscular hypertrophy were combined, and proximal to the region where muscular hypertrophy was evident. Sections were also obtained from similarly prepared control colons at comparable sites; these specimens had been resected for neoplasia. It was felt that a roughly quantitative comparison of the mural ganglia could thus be obtained.

The representative segments were blocked in the ordinary manner and sections, 10μ in thickness, were cut and mounted, then stained by the silver method described by Holmes (1947). The method was slightly modified by the use of 10 ml. of 1% silver nitrate (AR), 5 ml. of pure pyridine, and by impregnating the sections at 40°C. These modifications in the strength of reagents and temperature of impregnation have been found to improve the quality of staining.

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The slides were then examined microscopically and the ganglionic plexuses and nerve fibres studied; in all, 30 colons were examined.

RESULTS

The sections were examined by low-power, high-power, and oil-immersion magnification, and the quantity and distribution of the ganglia and nerve fibres was noted.

In the control tissue the intramuscular plexus was the most readily definable; the ganglia, aggregated in small clusters, appeared between the longitudinal and circular muscle fibres (Fig. 1). In the region between the taeniae ganglionic tissue was only evident after a careful search. This was the case in all sections studied (Table I).

Sections from cases with diverticula showed an

TABLE I

GANGLIA IN COLONS OF CONTROL SERIES

Region	*No. of Cases*	*Presence of Ganglia*
Recto-sigmoid	7	After search (6) Present (1)
Proximal, left colon	8	After search (8)
Proximal, right colon	4	Present (4)

TABLE II

GANGLIA IN EXCISED COLONS OF PRESENT SERIES

Region	*No. of Cases*	*Presence of Ganglia*
Recto-sigmoid distal to diverticula	15	Present (8) Present in abundance (7)
Diverticular and muscular hypertrophy	6	Present (3) Present in abundance (3)
Proximal to area of gross muscular hypertrophy	9	After search (2) Present (7)

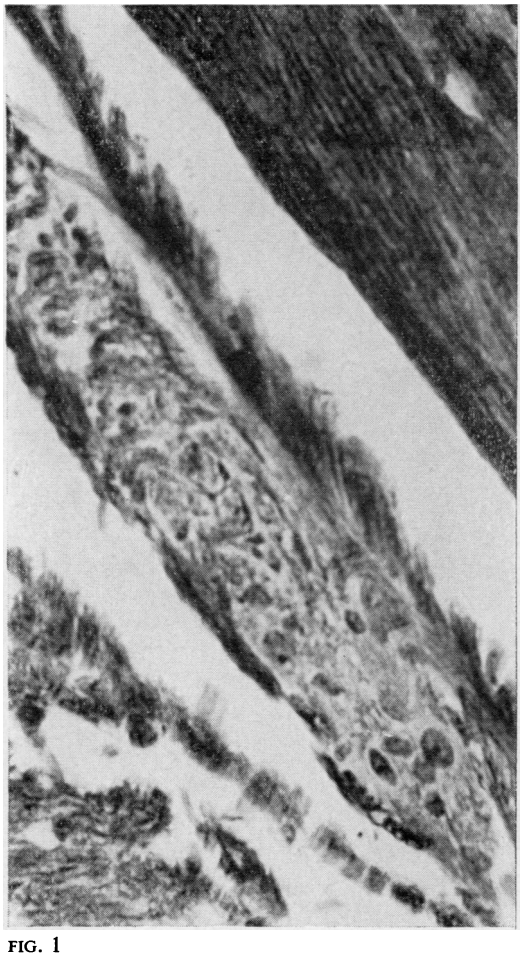

FIG. 1

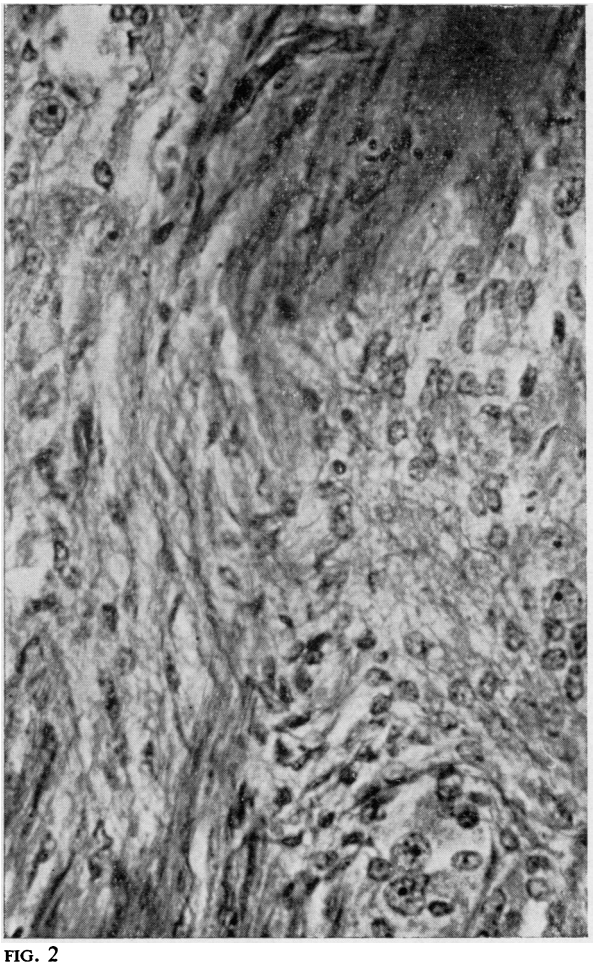

FIG. 2

FIG. 1. *Photomicrograph of the mural ganglia in section cut from the control series* (× *250*).
FIG. 2. *Photomicrograph of the mural ganglia within the area of muscular hypertrophy from specimens bearing diverticula. The plethora and altered configuration of the ganglionic aggregation may be gauged by comparison with Figure 1* (× *250*).

immediate difference, a plethora of ganglionic tissue, confined to the areas where muscular hypertrophy was evident; the sections studied proximal to muscular hypertrophy were comparable with those from the control group.

This preponderance of ganglionic tissue had the appearance of an overgrowth (Fig. 2); the ganglionic clusters were larger, more numerous, and often confluent. The neural plexuses were also traced with ease around the circumference of the bowel (Table II). The tissue was not confined between the two muscle coats but was also observed within the muscle layers themselves.

DISCUSSION

A difference in the intramural plexuses of the colon associated with muscular hypertrophy and diverticula has been readily observed on histological examination. Is this difference real or apparent and secondly, if real, of what significance is the finding?

It may be argued that the increase of neural tissue is merely a manifestation of the shortening and contracture of the bowel found in diverticular disease of the colon. This would account for an apparent increase in the intramural ganglia; however, it could hardly explain the altered configuration

observed in the shape and distribution. It would therefore seem fair to assume that the difference is real.

There is ample evidence to suggest that muscular activity is in some way associated with formation of diverticula. If only 10% of the population over the age of 40 acquired diverticula it would suggest that in these people the colonic physiology is altered. The plethora of neural tissue could reflect an acquired neuromuscular derangement and might then explain Painter's findings on the injection of morphia, and for that matter the muscular hypertrophy itself.

REFERENCES

Edwards, H. C. (1939). *Diverticula and Diverticulitis of the Intestine.* Wright, Bristol.

Holmes, W. (1947). In *Recent Advances in Clinical Pathology*, edited by S. C. Dyke, p. 404. Churchill, London.

Morson, B. C. (1963). *Proc. roy. Soc. Med.*, **56**, 798.

Painter, N. S. (1963). *Ibid.*, **56**, 800.