Definition of megacolon in colitis

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Statements that the colon is dilated as judged by radiographic appearances have an element of uncertainty because the range of normality is unknown. In this paper an attempt has been made to define the width of the normal colon in statistical terms and the validity of these definitions has been tested by comparison with the diameter of the colon in patients with severe idiopathic proctocolitis complicated by megacolon and in patients with total colitis without this complication.

MATERIAL AND METHODS

Measurements of the diameter of the colon were made on plain abdominal films provided these were taken before any bowel preparation had been performed, and on the films of patients who had undergone barium enema examination by the air-contrast technique. The tube-film distance generally used in taking these films was 50 cm. In both types of film the diameters of the ascending, transverse, and descending colon were measured to the nearest 0.5 cm. The ascending colon was measured at the level of L4, the transverse colon in the mid-line, and the descending colon at the level of the iliac crest. In many patients the colon could not be identified on the plain

film and occasionally measurement of a segment of the colon on the enema film proved impossible.

Radiographs of three groups of patients were studied. The first group comprised 100 patients who presented with a variety of colonic symptoms, but whose enemas were reported as showing no abnormality: they were regarded as normal controls. There was a second group of 31 patients with total proctocolitis who had been consecutively admitted to St Mark's Hospital for medical and surgical treatment. The third group consisted of 15 patients who had been diagnosed as having severe colitis with megacolon. Only plain abdominal films were available for study in this group as barium enema examinations had been avoided when megacolon was suspected.

RESULTS

These are summarized in the Table and Figure. In the normal group and in the patients with total colitis the width of the colon decreased progressively from the ascending through the transverse to the descending colon. The mean diameter of each segment of the colon in the patients with total colitis was less than in the normal group. Distension by air insufflation is doubtless the reason for the

TABLE
MEASUREMENTS OF DIAMETERS OF THE COLON IN THREE GROUPS OF PATIENTS

	Normal		Total Colitis		Megacolon	
	Air-contrast Technique	Plain Film	Air-contrast Technique	Plain Film	Plain Film	
	No. of Observations	Mean Diameter (cm) $\pm$ SD ¹	No. of Observations	Mean Diameter (cm) $\pm$ SD	No. of Observations	Mean Diameter (cm) $\pm$ SD
Ascending colon	99	6.0 $\pm$ 1.5 (4.0 - 8.0) ²	42	5.0 $\pm$ 1.5 (2.5 - 7.0)	30	5.1 $\pm$ 1.3 (3.0 - 8.0)
Transverse colon	93	4.9 $\pm$ 0.8 (3.5 - 8.0)	15	3.9 $\pm$ 0.8 (3.0 - 5.5)	30	3.4 $\pm$ 1.1 (1.0 - 6.5)
Descending colon	97	3.5 $\pm$ 1.7 (2.0 - 5.0)	43	3.0 $\pm$ 0.8 (1.0 - 5.0)	31	3.1 $\pm$ 0.8 (1.0 - 5.0)
					15	2.1 $\pm$ 0.8 (1.0 - 3.0)
					5	2.9 $\pm$ 0.8 (1.0 - 4.0)
					15	2.1 $\pm$ 0.8 (1.0 - 4.0)
					7	3.1 $\pm$ 0.8 (2.0 - 4.5)

¹The standard deviation was not estimated for the plain film measurements because many of these were zero and the distributions were therefore skewed.

²The figures in brackets show the actual range of measurements obtained.

FIG. 1. Diagram showing the diameter of the transverse colon in normal subjects, patients with total colitis, and patients with severe colitis complicated by megacolon. The boxed figures represent films where no measurement was possible.

greater calibre of the colon on enema films compared with that on plain films.

Severe dilatation of the colon in colitis mostly affects the transverse segment (Neschis, Siegelman, and Parker, 1968; Silverberg and Rogers, 1964). Measurements of the transverse colon were possible in only 15 of 69 plain abdominal films taken in normal subjects without bowel preparation; in five of these the colon was outlined by air and faeces and in 10 by air alone. In this group of 15, the mean diameter was 3.9 cm with a range of 3.0 to

5.5 cm. The upper limit of the normal range may thus be taken as 5.5 cm on plain abdominal radiographs. For enema films the upper normal limit was calculated to be 6.5 cm (mean + 2 SD).

The diameters of the transverse colon on plain films in the patients with severe colitis complicated by megacolon were all above the upper normal limit of 5.5 cm. Fifteen of the 30 measurements of the transverse colon on enema films in the patients with total colitis fell below the lower normal limit of 3.3 cm (mean - 2 SD), giving statistical confirmation of the contraction of the colon which is characteristic of many cases of colitis.

DISCUSSION

Phrases such as 'extreme dilatation' and 'marked dilatation' of the colon are commonly used in defining megacolon. Several workers have quoted average values for the diameter of the 'toxic megacolon' (Roth, Valdes-Dapona, Stein, and Bockus, 1959; McInerney, Sauer, Baggenstoss, and Hodgson, 1962; Silverberg and Rogers, 1964) but not until very recently has any attempt been made to define megacolon by comparing its diameter with that of the normal colon. Neschis *et al* (1968) estimated mean values for the diameter of the segments of the normal colon during barium enema examinations, but did not establish a normal range. Their mean values of 7.5, 5.6, and 3.9 cm for the ascending, transverse, and descending segments respectively, during air contrast examination, are slightly in excess of the corresponding figures obtained in this study. These authors suggested a diameter greater than 6.0 cm for the transverse colon as a diagnostic criterion of megacolon. In the present study megacolon has been defined as a transverse colon with a diameter greater than the upper limit of normal, which is 5.5 cm on plain abdominal radiographs and 6.5 cm on enema films. The mean diameter of the transverse colon on plain radiographs in our patients with severe colitis and megacolon was 8.2 cm which is in close accord with the mean value of 8.4 cm obtained by Neschis *et al* in patients with the same diagnosis.

A definition based on a simple measurement, taking 5.5 cm as the upper limit of normal of the transverse colon in the midline on a plain abdominal radiograph, may assist in the early diagnosis of megacolon, particularly as the patient may show no abdominal distension when an abdominal radiograph reveals marked colonic dilatation. Thus an accurate radiological assessment of dilatation of the colon, which must be taken in conjunction with other features such as mucosal irregularity, subserosal radiolucent lines, and small bowel dilatation

(Wolf and Marshak, 1959; Simon, Shapiro, Parker, Schein, and Weingarten, 1962) may be important in the management of the patient with severe colitis.

SUMMARY

The radiological upper limit of normal of the diameter of the transverse colon in the midline has been defined as 5.5 cm on a plain abdominal radiograph and 6.5 cm on double-contrast enema films. This definition has been tested in patients with colitis complicated by megacolon and found to be valid.

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