# DIVERTICULAR DISEASE OF THE COLON

Essay

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By

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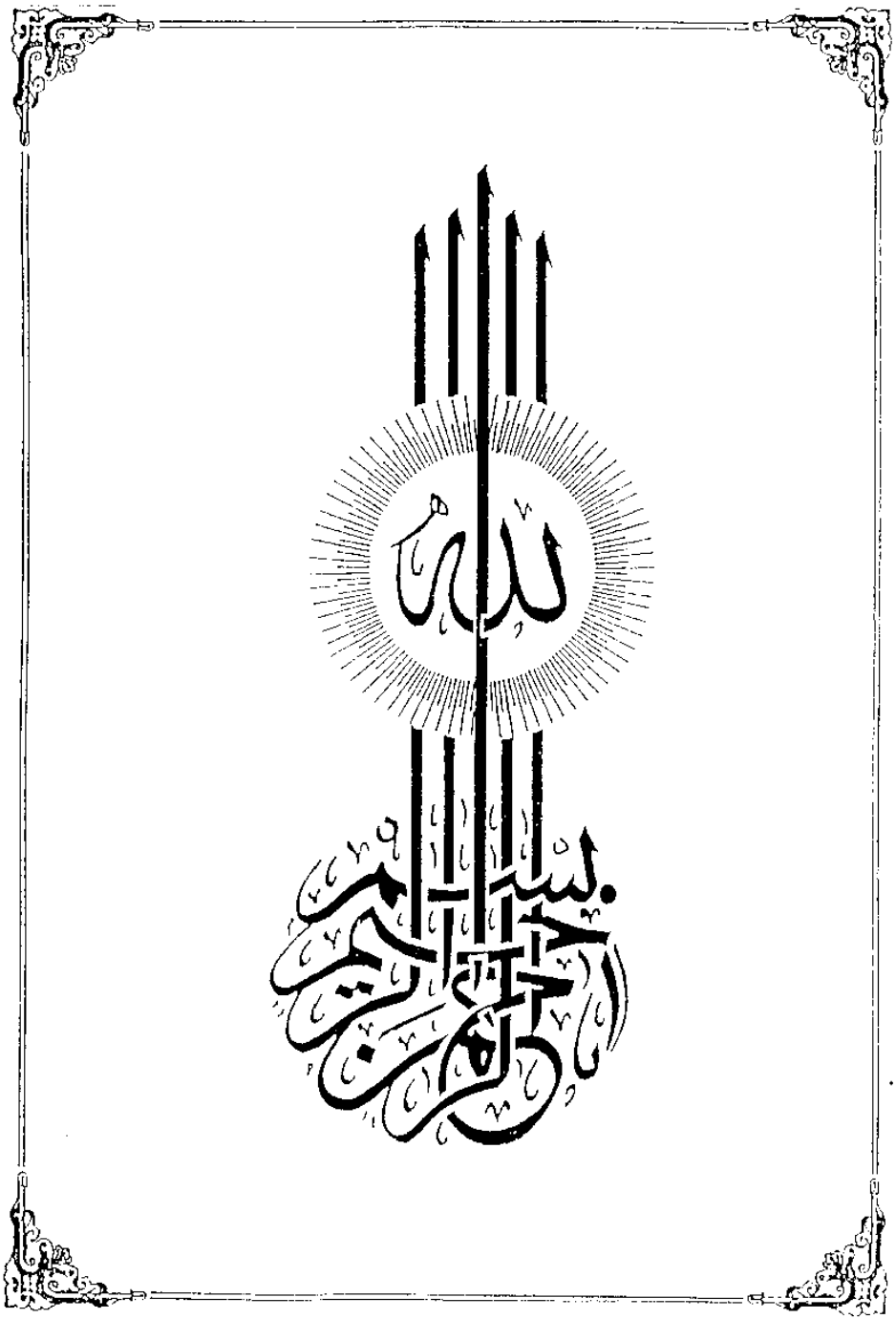
To My Parents



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# INTRODUCTION

Diverticular disease of the colon is a clinical problem of this century. A dramatic increase in its incidence has occurred since the beginning of this century probably because of changes in diet (Painter and Burkitt, 1975).

Today it is thought that 30 to 50% of the population older than 60 years have diverticulosis (Almy and Howell, 1980).

Diverticular disease of the colon has become increasingly well recognized throughout the western world. As a result, the number of admissions for diverticular disease in the United Kingdom has increased from 13 to 24 per 100,000 of the population over the past 15 years (Kyle and Davidson, 1975).

The understanding of the pathogenesis and clinical significance of diverticular disease of the colon depends upon the development of surgical, radiologic, experimental and therapeutic techniques of the modern era (Rodkey and Welch, 1984).

This essay aims to review the literature concerning the epidemiology, pathogenesis, diagnosis and various lines of treatment of diverticular disease of the colon.

# SURGICAL ANATOMY OF THE COLON

## Large Intestine

The large intestine is 1.8 m. long. Its longitudinal muscle coat is arranged round it in three bands, the taeniae coli. These bands are 1.2 m. It is therefore "gathered" by the muscle to form characteristic sacculations. Its two terminations, rectum and appendix, are completely surrounded by muscle. These two portions are therefore not sacculated (McGregor and Duplessis, 1975).

## Ascending Colon

The ascending colon is 12-20 cm. long. It begins at the level of the entry of the ileum in the right iliac fossa, on the anterior surface of the iliacus. It ascends over the iliac crest and quadratus lumborum in the paravertebral gutter and crosses the lateral cutaneous nerve of the thigh, the ilioinguinal and iliohypogastric nerves. It ends on the anterior surface of the inferior part of the right kidney, posterior to the liver. Here it turns sharply to the left, and forms the right flexure which is continuous with the transverse colon.

The peritoneum covers the front and sides of the ascending colon and binds it to the posterior abdominal wall. Sometimes the peritoneum may surround it to form a short ascending mesocolon. The anterior abdominal wall is

immediately in front of it, but the greater omentum and small intestine may intervene.

The right flexure is in direct contact with the right kidney posteriorly, but elsewhere is covered with peritoneum. The right lobe of the liver overlaps it antero-superiorly and laterally (Romanes, 1973).

The caecum and the ascending colon receive blood from two arterial branches of the superior mesenteric artery: the ileocolic and right colic arteries. These arteries form arcades from which vasa recta pass to the medial colon wall.

As the vasa recta reach the surface of the colon, they divide into short and long branches, the former serving the medial or mesenteric side of the colon and the latter serving the lateral and antimesenteric side. The long branches send twigs into the epiploic appendages (Skandalakis et al., 1983).

Anastomosis between the right colic and ileocolic arteries is absent in 5 percent of subjects (Steward and Rankin, 1933).

**Transverse Colon:**

This is usually the longest (40 - 50 cm) and most mobile part of the colon. It begins at the right flexure, and suspended by the transverse mesocolon, arches across the abdomen with its convexity antero-inferiorly. It ends in the

left flexure on the lateral margin of the left kidney, immediately inferior to the spleen. The lowest part of its convexity may reach well below the umbilicus in the erect position, but is usually immediately superior to it in the recumbent position. If the intestines are distended, it may be pushed superiorly either posterior or anterior to the stomach. In the latter case it may, if distended with gas, make the upper abdomen tympanitic to percussion and partly mask the dullness of the liver to percussion. Thus mimicking the presence of gas in the peritoneal cavity.

The transverse colon is suspended by the transverse mesocolon behind the omental bursa and is fused to the posterior surface of the greater omentum except at its extremities where the mesocolon is short. The transverse colon begins anterior to and sometimes directly in contact with the descending part of the duodenum and the head of the pancreas, and posterior to the liver and fundus of the gall bladder. It then crosses anterior to the horizontal part of the duodenum and coils of the jejunum. On the left it extends up to the spleen, anterior to the left kidney and posterior to the greater curvature of the stomach or the left margin of the greater omentum. The transverse mesocolon (mostly fused with the greater omentum) extends postero-superiorly from the transverse colon to a linear attachment to the descending part of the duodenum, the head and lower margin of the body of the pancreas and the anterior surface of the left kidney.

The left flexure lies at a slightly higher level, is more acute, and further lateral than the right flexure. It lies on the lateral margin of the left kidney and is attached to the diaphragm by peritoneum (phrenicocolic ligament) below the spleen. Occasionally it has a short mesentery (Romanes, 1973).

The transverse colon is supplied by the middle colic artery from the superior mesenteric artery. The middle colic artery bifurcates from 3 to 11 cm. from the colonic wall (Steward and Rankin, 1933). It may be absent in 5 to 8 percent of individuals (Skandalakis et al., 1983).

**Descending Colon:**

The descending colon (30 cm) passes inferiorly from the left flexure to the margin of the superior aperture of the lesser pelvis. It is attached by peritoneum to the posterior abdominal wall in the left paravertebral gutter and iliac fossa. At first anterior to the diaphragm and lateral surface of the left kidney, it passes over transversus abdominis, quadratus lumborum, and the iliac crest in front of the same nerves as the ascending colon. It then crosses the left iliac fossa to the anterior superior iliac spine, and turning medially, superior to the inguinal ligament, crosses iliacus, the testicular or ovarian vessels and the femoral nerve, psoas and the genitofemoral nerve, and joins the sigmoid colon anterior to the external iliac vessels (Romanes, 1973).

The descending colon is supplied by the left colic from the inferior mesenteric artery. The inferior mesenteric artery arises from the aorta opposite the lower portion of the 3rd lumbar vertebra. The origin tends to become lower with age (George, 1935).

The left colic artery may reach the splenic flexure (86 percent) or may join the marginal artery short of the flexure (14 percent) (Skandalakis et al., 1983). There is point of circulation weakness at the splenic flexure (Griffiths, 1956).

**Sigmoid Colon:**

This part of the colon varies greatly in length (15-80 cm; usually approximately 30 cm) and extends from the end of the descending colon to the pelvic surface of the third piece of the sacrum where it joins the rectum. When of normal length, it lies free in the lesser pelvis inferior to the small intestine, but when long it may lie in any part of the abdomen that the length of its mesentery (sigmoid mesocolon) allows (Romanes, 1973).

The pelvic mesocolon has a $\wedge$ shaped attachment. The left limb of the $\wedge$ is attached to the brim of the left side of the pelvis. The right limb of the $\wedge$ passes from the apex down to the third piece of the sacrum. The apex of the $\wedge$ is situated exactly over the left ureter where it crosses the pelvic brim. This is the surgeon's guide to the left ureter. The

mesocolon carries the superior haemorrhoidal vessels (McGregor and Duplessis, 1975).

The sigmoid colon is supplied by one to nine sigmoid arteries from the inferior mesenteric artery (Skandalakis, et al., 1983).

**Taeniae coli:**

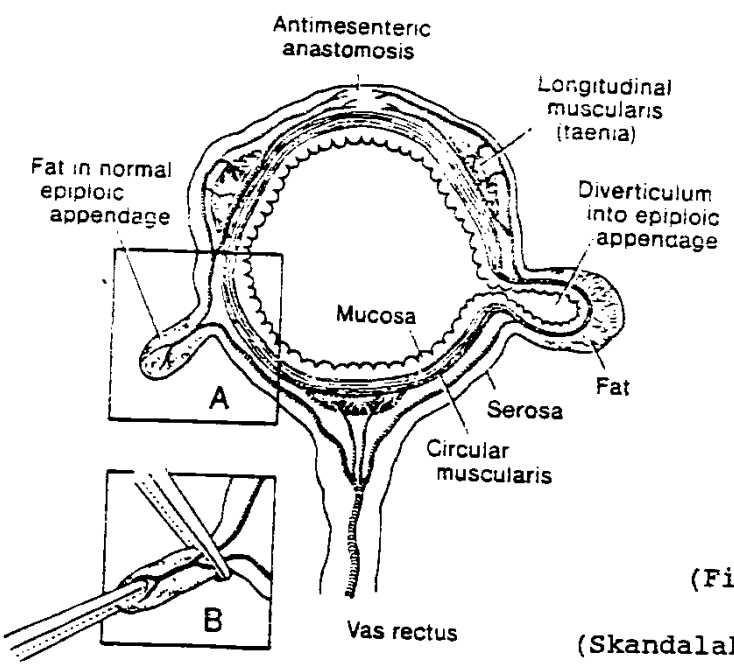
These are three ribbon-like thickenings of the otherwise thin layer of longitudinal muscle in the caecum and colon. They diverge from the longitudinal muscle of the appendix vermiformis and end by spreading out on the terminal part of the sigmoid colon to become continuous with the longitudinal muscle of the rectum. They are uniformly spaced around the circumference of the colon, and the wall of the colon and caecum between them forms three rows of puckered pouches. In the ascending and descending colon the positions of the Taeniae are anterior, posteromedial and posterolateral (Romanes, 1973).

The taeniae coli continue from the ascending colon. Due to the looping downwards and forwards of the transverse colon from the flexures, which lie well back in the paraveretbral gutters, some rotation of the gut wall occurs at the flexures, and the anterior taenia of ascending and descending colons lies posteriorly, while the other two lie anteriorly, above and below (Last, 1978).

**Epiploic Appendages:**

Are small pouches of peritoneum from 3 to as many as 15 cm in length, depending on the obesity of the patient. They arise in two rows chiefly from the lateral and medial inter-taenial areas of the transverse and descending colon. They may be present any where from the caecum to the proximal rectum. The epiploic appendices are of interest to the surgeon because they may be the sites of diverticula (Skandalakis et al., 1983).

The fat may conceal the presence of the diverticula on inspection, but fecolith in the diverticula are frequently palpable. The appendices are also subject to infarction and torsion; both produce symptoms of acute abdomen. Epiploic appendages should be ligated without traction lest a loop of a long colic artery be pulled into the appendicular neck and be included in the ligation (Goligher, 1980).



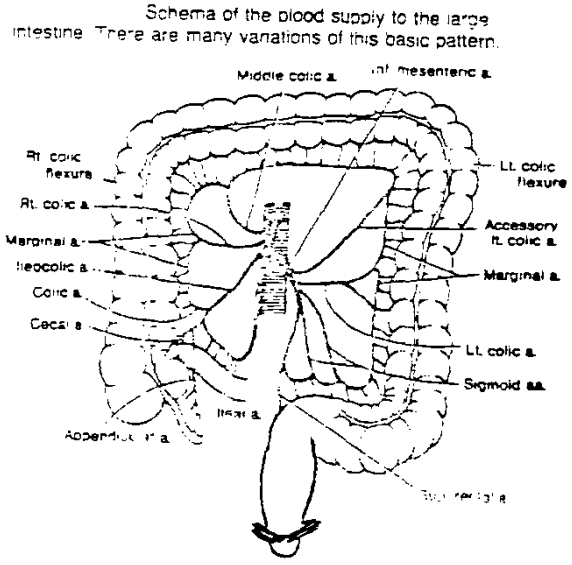

(Fig. 1)

(Skandalakis et al., 1983)

Diagram of the transverse colon showing long and short branches of the vasa recta. On the left is a normal epiploic appendix; on the right, a diverticulum extending into an epiploic appendix. *Inset*: Effect of too much traction on an epiploic appendix resulting in injury to a long branch of a vas rectus followed by antimesenteric ischemia.

**The Marginal Artery (of Drummond):**

The marginal artery is composed of a series of archades forming a single vessel that parallels the mesenteric border of the large intestine from 1 to 8 cm from the intestinal wall. It may or may not terminate at the superior rectal artery (Skandalakis et al., 1983).




(Fig. 2)

(Skandalakis et al., 1983)

Making a loop colostomy. The colostomy rod must be passed through the mesentery immediately medial to the colon so that the marginal artery is not damaged (McGregor and Du plessis, 1975) successful colo-rectal and aortic surgery is based upon the preservation of the blood supply to the

descending colon and rectum from the marginal artery, when the inferior mensenteric artery is obliterated (Billings and Nicholis, 1984).

Although the marginal artery is a constant feature, the point of anastomosis between the superior and inferior mesenteric vessels at the splenic flexure may be critically narrow (Marston, 1977).

So an initial defunctioning transverse colostomy should be raised well to the right of the middle colic artery (Griffiths, 1956).

The patient is in a high risk category for development of ischemia of the colon if there is an occlusion or absence of the marginal artery at the splenic flexure or enlargement of the left colic artery, suggesting occlusion of the superior mesenteric artery (Siddharth and Smith, 1981).

**Venous Drainage of the Colon**

Veins of the colon follow the arteries on the right, the veins join to form the superior mesenteric vein. Veins of the hepatic flexure and the right portion of the transverse colon enter the gastroepiploic vein or the anterosuperior pancreaticoduodenal vein. Drainage from the left portion of the transverse colon enters the superior mesenteric vein. The superior rectal vein drains the descending and sigmoid colon; it passes upward to form the inferior mesenteric veins (Skandalakis et al., 1983).