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CARCINOMA OF THE RECTUM
A THESIS
AS A PARTIAL FULFILLMENT FOR
THE MASTER DEGREE OF SURGERY

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Epidemiology of cancer rectum

Carcinoma of the rectum is the fourth most common variety of malignant tumours found in women, and its frequency in men is surpassed only by carcinoma of the bronchus and stomach.

(Bailey and Love 1980)

Carcinoma of the colon and rectum is the commonest tumour of G.I.T. It forms about 15% of all malignant tumours of the body. (Goligher 1980).

In U.S.A. Third National Cancer Survey (1969-1971) revealed an incidence of 32.9% for males and 29.4 for females of all races per 100,000. In Japan, carcinoma of the rectum is about the same as in U.S.A. In Africa, most of the cases of large bowel cancer are found in the rectum and usually in younger individuals. Burkitt attributed this to the dietary factors (Ackerman del Regota 1977).

According to the vital statistics of U.S.A. (1951) cancer rectum represented 1% of all malignant tumours of the human body.

Gabriel (1952) found the same figure. It was known by Boyd (1972) that 75% of malignancies of large bowel were of rectal origin.

In the registered death figures for 1969 in England and Wales, there were 15,778 patients dying from cancer of the large bowel and of these 5,883 had a malignant neoplasm of the rectum. (Maingot 1979).

Goligher (1957) reported that carcinoma of the proximal part of the rectum is more common than in the distal part.

He also found that more than 60% of these cases occurred over the age of 60 and few cases were below 50 years and the age of 30 represented only 2.1% of all cases.

In Egypt, the incidence of carcinoma of the rectum is lower than in other countries. Mehrez et al (1959) found among 993 autopsies and 15 277 biopsies at Kasr El Aini hospital 214 cases malignant tumours of G.I.T. Twenty-one cases were in the colon and 147 cases in the rectum.

El Sebni and Abdeen (1961) found that out of 559 cases of G.I.T. tumours 312 cases occurred in the rectum. El Mazny et al (1972) recorded that the mean age incidence for rectal carcinoma was 47.9 years with male to female ratio of 1.7:1.

Anatomy of the rectum

The rectum is the direct continuation of the pelvic colon, and when straightened out, is about 12 cm in length.

It begins opposite the third piece of the sacrum and follows the curvature of the sacrum and coccyx, it ends 2.5 cm beyond the tip of the coccyx by bending sharply backwards to become the anal canal.

The following discussion will concentrate on the anatomical aspects related to rectal cancer-i.e. on blood supply and lymph drainage.

BLOOD SUPPLY OF THE RECTUM

It is mainly derived from the superior haemorrhoidal artery, a direct continuation of the artery of the hindgut, the inferior mesenteric. After the lowest sigmoid artery has entered the pelvic mesocolon, the vessel touching but not crossing the medial side of the left ureter, crosses the bifurcation of the left common iliac vessels and descends in the base of the inferior limb of the pelvic mesocolon to the beginning of the rectum opposite the third piece of the sacrum. The artery here divides into right and left branches. The right dividing into anterior and posterior branches. These three primary vessels sink into the muscle coat in the line of the three primary haemorrhoids (4, 7 and 11 o'clock around the clockface) at the anal margin when viewed in the

lithotomy position. These branches supply the mucous membrane of the rectum as far down as the mucocutaneous junction of the anal canal (dentate line). They terminate as a capillary plexus.

Additional blood supply to the rectum is derived from the middle and inferior haemorrhoidal arteries.

The middle haemorrhoidal arteries spring from the anterior divisions of the internal iliacs and proceed medially and forward below the pelvic peritoneum, in the tissue of the lateral ligaments to reach the rectal wall where they anastomose with the branches of the superior and inferior haemorrhoidal vessels.

The inferior haemorrhoidal vessels are derived indirectly from the internal iliac through its internal pudendal branch. They supply the anal sphincters, anal canal and skin of the anal margin.

Goligher (1980) stated that his experience with sphincter saving resection for carcinomas of the upper rectum and lower sigmoid shows that after division of the inferior mesenteric trunk, the middle and inferior haemorrhoidal arteries are capable of nourishing a distal rectal stump up to a point at least 8-10cm above the peritoneal reflection.

Finally, some small twigs from the middle sacral artery, the atrophic continuation of the abdominal aorta, reach the back of the rectum in the hollow of the sacrum. The significance of the middle sacral artery to the surgeon, is that during rectal

excision, it is regularly exposed as the rectum is lifted off the front of the sacrum from above and is divided when the coccyx is disarticulated from below sometimes giving rise to troublesome bleeding.

Venous drainage of the rectum

The veins of the rectum comprise the superior haemorrhoidal which drains into the inferior mesenteric and portal system, and the middle and inferior haemorrhoidal which enter the systemic venous circulation via the internal iliac veins.

The superior haemorrhoidal venous plexus lies in the submucosa of the upper part of the anal canal and lower 2cm or so of the rectum. Thence five or six collecting veins pass upwards in the wall of the rectum, at first they run in the submucosa but gradually they penetrate the muscle coat to be in the perirectal fat where they unite to form two main veins and eventually the single superior haemorrhoidal trunk. The middle haemorrhoidal veins are small and drain into the internal iliac vein.

The inferior haemorrhoidal vein drains the subcutaneous or external haemorrhoidal plexus of veins. This plexus communicates with the internal haemorrhoidal plexus and normally drains partly upward along the superior haemorrhoidal veins. Thus, there is link between the systemic and portal venous system.

Lymphatic drainage of the rectum

Jamieson and Dobson (1909) found that the lymphatics responsible for drainage of the colon could be considered as being in two closely connected groups: the intramural and the extramural lymphatics.

The intramural lymphatics:

Throughout the colon and rectum there are continuous lymphatic plexuses in the submucous and subserous layer of the bowel wall which are connected and drain into the extra mural lymphatics.

The extra mural lymphatics of the rectum:

They follow the blood vessels supplying this part of the intestine, and there are three main routes of lymphatic drainage:

- (1) Upward: through the lymphatics and glands accompanying the superior haemorrhoidal and inferior mesenteric vessels essentially to the aortic glands. There may also be some drainage to the epicolic and paracolic glands along the sigmoid colon.
- (2) Laterally: along the middle haemorrhoidal vessels on either side to the internal iliac glands on the corresponding side wall of the pelvis. There may be some glands also in the course of these lymphatic channels on the upper surface of the levator ani muscles and in the substance of the lateral ligaments but apparently the main collection is on the pelvic side wall.

- (3) Downward: through pararectal lymph glands on the back of the rectum and along lymphatic plexuses in the anal and perianal skin, the anal sphincters and ischiorectal fat to reach eventually the inguinal lymph glands or the glands along the internal iliac vessels.

Injection experiments by Villemain et al (1925) suggested that while lymphatic drainage from the extraperitoneal or ampullary part of the rectum may take place along all three routes, that from the intraperitoneal part is exclusively upward along the superior haemorrhoidal and inferior mesenteric vessels. This is obviously a matter of great significance in regard to the spread and surgical treatment of rectal cancer.

Pathological investigation of the mode of **extension** of this form of carcinoma shows that the main direction of spread from growths in any part of the rectum is upward along the superior haemorrhoidal vessels (Westhues 1934, Duker 1940). Metastases have been demonstrated in the internal iliac glands in some cases with growths in the extraperitoneal part of the rectum but not in cases with intraperitoneal part (Sauer and Bacon 1952). It is well known that metastases occur in the inguinal glands in cases of rectal or anal carcinoma only when the skin of the anal canal or perianal region is involved by the growth. (Gabriel 1948).

Pathology of Rectal carcinoma

This includes:

- | | |
|----------------------------|---------------------------|
| 1) Precancerous conditions | 2) macroscopic features. |
| 3) microscopic features | 4) histological grading. |
| 5) modes of spread | 6) stages of progression. |

(1) Precancerous lesions

The basic processes underlying the development of carcinoma of the rectum are unknown. But the following lesions are possible predisposing factors.

1) Villous papilloma

The evidences in favour of regarding villous papilloma as precancerous lesions are very strong. These evidences are:

- A. It is a well known clinical phenomenon for villous papillomas to undergo carcinomatous change after many years of apparently benign existence. (Gallagher 1980).
- B. Histological examination of villous papillomas removed at operation often reveals the presence of malignant foci. Southwood (1962) found 41.6% of malignant change in 180 cases examined. Enterline et al. (1962) found 55% of malignant change in 81 cases.
- C. Pathological examination of large numbers of frank carcinomas of the rectum and colon discloses the presence in some of them of villous papillomatous tissue, suggesting that the

the cancer had originated in a pre-existing benign lesion of this kind. Gabriel (1952) stated that 98 of 969 malignant rectal growths, were reported by the pathologist to have arisen in papillomas.

Wheat and Ackerman (1958) reported that in 76% of all villous papillomas reviewed by them, there were atypical changes, focal carcinoma or frankly invasive carcinoma.

2) Familial polyposis

It is a hereditary disease characterized by the development of large numbers of adenomatous tumours. It was L. Lockhart-Mummery (1925) who drew attention to the heavy predisposition to the development of carcinoma of the large intestine that exists in patients affected by familial polyposis. Dukes (1952) emphasize this risk. He said that polyposis is the most clearly defined pre-cancerous disease known. He diagnosed carcinomatous change in this lesion most frequently about 15 years after the commencement of symptoms of polyposis. The average age of these patients was 35 years.

After colectomy and ileorectal anastomosis as a treatment of colonic familial polyposis, Cole and Holden (1959) found polyps in the rectal stump regressed and even disappeared. In St. Mark's hospital (1959) only two of 85 patients in whom the operation had been carried out had a carcinoma in the rectal stump.

3) Gardner's syndrome

Gardner's syndrome includes familial polyposis with associated multiple sebaceous or dermoid cysts, bony exostoses or connective tissue tumours as pointed out by Gardner and Richards (1953). It was estimated by Waugh et al (1964) that approximately 10% of sufferers from polyposis coli manifest this syndrome.

As the associated lesions in Gardner's syndrome may appear before the development of the polyposis, they have a considerable diagnostic significance. When multiple soft or hard tissue tumours are encountered in clinical practice, the patient should always be examined by sigmoidoscopy, etc - to exclude polyposis of the rectum and colon. (Laberge et al. 1957).

4) Long standing anal fistula

A number of cases have been recorded in which a carcinoma arose in connection with a chronic anal fistula, which had usually been present for several years. Romner (1931) reported 14 cases of this kind, seven collected from the literature and seven from his own personal experience, the growth in seven cases was an adenocarcinoma, in two a colloid carcinoma, in three a squamous carcinoma, in one a basal-celled carcinoma and in one its histological features were not stated. Gabriel (1948) added a further four personal cases to the literature. Since then further cases have been reported—one by Milliken (1960), four by Schwartz (1963) and