Cancer of the Colon, Rectum and Anal Canal

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Foreword

The student of neoplastic diseases, whether he is an undergraduate, a recent novitiate into the practice of the healing arts, or a mature, experienced doctor, early discovers that definitive and authoritative books are essential for the continuance of his education. Practice is only one of the dual disciplines of perpetual education; the other is recourse to books. Gibbon has characterized these two educations as one which the student gives himself and one which he must receive from others. The library is the most important chamber in the domicile of the scholar, the scientist, the physician; a collection of selected books is the real university, said Carlyle, and Cicero described a room without books as a body without a soul. A survey of a man's library provides a fairly accurate picture of the erudition, the culture and the character of the collector.

Even more gratifying than the possession and the assimilation of books is the creation of a book, which embodies the interests, the experience and the concepts of the author, colored by what he has learned from those who preceded him. *Cancer of the Colon, Rectum and Anal Canal* is such a volume, and Professor Harry E. Bacon is such an author. His book is a logical outcome of his incredibly rich experience with these formidable cancers. The book is enhanced by numerous illustrations and contains a wealth of useful material on the diagnosis and the management of these neoplasms. Dr. Bacon has given greatly of himself in the compilation of this manuscript; like the true man of Carlyle for whom perpetual labor and self-abnegation are alluring, he has devoted selfless days and nights in research on this, his primary interest. In a perusal of his book and as a witness of his efforts in completing it, I am reminded of a quatrain, appropriate for this occasion:

> The heights by great men reached and kept,
> Were not attained by sudden flight,
> But they, while their companions slept
> Were toiling upward in the night.

It has been said humorously that old men should read new books, and young men should read old books, but speaking as a veteran both in the reading and the writing of books, I find myself in agreement with Jeremy Collier, who said that books are a guide in youth and entertainment in old age. *Cancer of the Colon, Rectum and Anal Canal* is a scientific delight for physicians of all ages; the assimilation of its contents makes a young man old in knowledge; *old,* as Fuller said, "Without wrinkles or grey hair, privileging him with the experiences of age, without either the infirmities or the inconveniences thereof."

GEORGE T. PACK

Preface

In a recent article published by the American Cancer Society it was estimated that 39,900 persons in the United States died of cancer of the rectum and the colon during the year 1962. It is to be realized that these parts, namely the rectum and the colon, are the most common sites for cancer; that approximately 75 per cent occur in the distal bowel, and that cancer of the rectum can be diagnosed with greater accuracy than that of any other internal organ. With these facts in mind, it is of profound importance that the medical profession, individually and collectively, recognize the responsibilities inherent in this challenge.

The purpose of this treatise is to discuss the subject in its various aspects, to correlate all pertinent data available and to review the experiences of the author based on a personal series of 2,160 patients with cancer of the colon, the rectum and the anal canal. While this group may be considered perhaps a representative series by a single author, it is not particularly large when one realizes that this material embraces nearly a 22-year period (September 1940 to June 1962) or slightly less than 100 cancer patients per year. Calculations for statistical purposes have been made to June 1962 with no addition of cases since that time.*

The first line of attack of the cancer problem is earlier diagnosis. During the past 15 years it has been our custom to perform a digital and sigmoidoscopic examination annually on each patient over the age of 35, and to examine the colon roentgenologically by the double-contrast technic every second year. Our records attest to the value of this routine procedure. Were this method employed by all physicians throughout the country, precancerous lesions could be detected and removed before they become malignant, and cancerous growths could be diagnosed and extirpated earlier. By the institution of such a program the present 25 per cent 5-year over-all cancer-free survival rate for all patients would be nearly tripled.

Worthwhile results are being achieved through "Comprehensive Cancer Detection Clinics," although at present the development of the program is in its infancy. It has always seemed unrealistic to the writer that only the top executives of many of our larger corporations are required to submit to a complete physical examination each year, a requirement which has paid rich dividends in terms of health. These companies are anxious to keep their officers well and fit, and the costs borne by the organization are comparatively negligible. If the same principle could be applied to every worker in all areas of employment, and the costs absorbed on a union-company percentage basis, it is reasonable to assume that tremendous advances would be made in solving the cancer problem. It is not enough for only a small segment of our population to be accorded periodic medical examinations.

Improvements and refinements in diagnosis, preoperative preparation and postoperative care, anesthetic management and ancillary services, as well as surgical technic, have reached a high plane of achievement. In this treatise particular emphasis is placed on our study of the lymphatics of the left colon and the rectum. Our current knowledge of adenomatous polyps is discussed with particular reference to their relationship to carcinoma. Our experience with diffuse familial adenomatosis is discussed comprehensively. The evaluation prior to surgery of factors which may influence the degree of extirpation is considered. The findings at the time of operation that affect prognosis are stressed. Handling of the primary growth—its protection and occlusion to prevent contamination, implantation and desquamation of cancer cells—is taken up in detail. Early ligation of major vessels concomitant with curative resection and the rationale of aortoileopelvic lymphadenectomy with high inferior mes-

* 2290 patients to December 1963.

enteric ligation, which has been employed in more than 570 patients, is recorded. Prophylactic oophorectomy, which we have performed during the past 12 years, as well as our experience with radical and ultraradical surgical procedures are noted. Our results following reresection for recurrent carcinoma are reported. Colostomy, ileostomy and jejunostomy with particular reference to the refinements in technic and the management of inherent complications are discussed in detail.

The complications occurring during resection are reviewed in terms of frequency, how they may be avoided and their management. This discussion embraces particularly shock, infections, injuries to the ureters, the bladder and the urethra, obstruction and thrombophlebitis. The technics of various procedures are described, ranging from total ileocoloproctectomy to radical groin dissection. In each, the mortality, the morbidity, the complications and the long-term survivals are presented.

Because of the interest accorded the "pull-through procedure," which the author has employed in over 700 patients, this subject is reviewed in detail. A comparative study of the results of the pull-through, the Miles operation and the low anterior resection is recorded. Our experience and results with transabdominal colonoscopy, which we began using in the early forties, are described.

Palliation, which connotes preservation of relatively normal and comfortable living in the face of an inevitably fatal outcome, is entitled to profound attention because it is too frequently neglected. Our philosophy in this regard and the therapy used are presented in the hope that others may apply these concepts to their individual problems.

Aortography and lymphography are emphasized as experimental procedures.

An extensive bibliography has been prepared with the object of giving credit to the many pioneers in this branch of medicine, to offer an easy means of reference and to open up further fields of thought and investigation.

HARRY E. BACON

Acknowledgments

Dr. Robert Robbins and Dr. Martha Southard have prepared an excellent chapter on Radiation Therapy; they speak with the authority of long experience. Dr. Meschter has presented in detail the anesthesiologic management of patients undergoing surgery for cancer of the large bowel and has emphasized the value of fractional epidural anesthesia.

In 1962 Dr. Porfirio Recio and the author published a small treatise on *Surgical Anatomy of the Colon and Rectum*, the illustrations for which were prepared by Mr. Yajuma who had come to us from Chiba, Japan, through the courtesy of Professor Nakayama. To Dr. Recio acknowledgment is made for the use of these drawings in the present treatise.

It would be an impossible task to detail all the investigative work by the many devoted residents in our department during the past 22 years. Yet the author would be remiss were mention not made of the detailed study of the blood supply to the left colon and the rectum by Smith and by Hardwick, the exhaustive investigation by Rowe on the bacterial flora for bowel preparation, the use of high oxygen concentration postoperatively by Sherman, the 4-year study on the lymphatics by Sauer, the clearing of specimens employing the Spalteholz-Gilchrist technic by McElwain and Valiente, the altered acid-base equilibrium of the colon by Recio, the experiments of nonsurgical peritonealization in dogs by Trimpi, and the investigations on the chemical contents of ileal and jejunal discharges following ileectomy, total colectomy and proctectomy by Nuguid and also by MacLean, the work on postoperative obstruction by Carroll, the experiments with antitumoral agents by Dirbas and the correlation of chemotherapeutic data by Speer.

During the last year of his residency, Teodoro Nuguid dedicated himself to the correlation of much material for the present treatise, and recognition must be accorded him. Initially he condensed our treatise on surgical anatomy, at that time in galley sheets, and correlated it with previous publications of the author. The material on etiology was completely rewritten in the light of our present knowledge. Many hours at night and on weekends were spent in the record room to obtain pertinent information from patients' charts. He reviewed the literature on adenomatous polyps, and the resultant charts on incidence are highly representative. Moreover, the chapter on preoperative and postoperative management was brought up to date. To this brilliant young surgeon the author is profoundly grateful.

A few years ago Dr. Stuart T. Ross and the author published an *Atlas of Operative Surgery* (C. V. Mosby and Company). With the permission of Dr. Ross a large number of these illustrations have been used in Chapter 14 under surgical technic. Also to Dr. Ross the author expresses sincere thanks for proofreading the original 18 chapters of the manuscript. His editorial acumen and suggestions have proved to be invaluable, and the author is most appreciative.

Without the able assistance of Miss Lucile Grebenc, consultant-editor to our department, whose experience and skill have contributed materially to the completion of this treatise, this volume could not have become a reality.

The author makes grateful acknowledgment to his friends and colleagues, Morton J. Oppenheimer, Professor and Head of the Department of Physiology, for his counsel regarding aspects of bowel physiology; Augustin R. Peale, Professor of Pathology, for photomicrographic descriptions; James A. Day, Professor of Medicine and Head of the Department of Hematology, for his comments on shock; Henry Waloshin, Professor of Radiology, for his continued cooperation in the interpretation of films, and Norman Learner, Professor of Medicine and Head of the section on Peripheral Vascular Disease, for reading the proof on phlebothrombosis and thrombophlebitis.

Credit should also be accorded Mrs. Thelma V. Minter who has served our department for the past few years as volunteer councilor for rehabilitation. Our patients with colostomy and particularly those with ileostomy and jejunostomy have found reassurance which has proved to be of inestimable aid in physical and mental adjustments.

Expressions of gratitude go to my secretaries, Mrs. Joan Bradley, Mrs. Edyth Malloy, Miss Sandra Grossman, Miss Judith Fredericks, Miss Kathleen Dolan, Miss Mary-Eileen Kieffer, Miss Susan Harvanek and Miss Rosena Fogarty for typing the manuscript through several rewritings and to Mrs. E. Mandelbaum for biometric calculations. To Miss Alberta Dill a very special tribute is accorded for her faithful service embracing 22 years as the author's operating room scrub nurse. In no small measure her exactness for detail is reflected in the lowered incidence of postoperative complications and sequelae.

The author is indebted to Mr. Melford D. Diedrick, Director of Medical Illustrations at the University of Buffalo; Mr. Leon Schlossberg, Department of Medical Art, Johns Hopkins Medical Center; Mr. William B. McNett, formerly Head of the Department of Medical Art; Mr. Yun Yong, presently Head of the Department of Medical Art at Temple; Mr. Tetsuo Yajuma, Head of the Department of Medical Art at the University of Chiba, Japan; Miss Ellen Cole, formerly of the Harrison Department of Surgical Research of the University of Pennsylvania Medical School, and Miss Barbara Finneson for the excellence of their illustrative material.

And credit must be accorded to Mr. William J. Taylor, Head of the Department of Photography at Temple University and to Messrs. Gilbert and Ring for preparing the prints and the photomicrographs used in the text.

Mention should be made of the conscientious assistance rendered by the late Mr. James Keegan in arranging translations of important articles in German, French, Italian and Russian and the Scandinavian languages. Several of our past and present residents have contributed translations from Spanish, Portuguese, Thai, Chinese and Hindustani.

The warmest thanks of all must be accorded my wife, Althea Perot Bacon, whose affection, understanding and wise counsel during the preparation of this and other books have been a constant source of inspiration and in no small measure lightened the grim hours of nightly toil and transformed them into hours of pleasant endeavor.

Finally, to the publishers, J. B. Lippincott Company, the author wishes to express his appreciation, particularly to Mr. Stanley Gillet, Mr. Brooks Stewart and Mr. Walter Kahoe for their counsel, cooperation and patience.

THE AUTHOR

Contents

CHAPTER 1

Surgical Anatomy

A thorough knowledge of the anatomy of the colon, the rectum and the anal canal is of paramount importance in the planning and the performance of operations on these organs, especially when they are the seat of malignant lesions. Adequate removal of all possible avenues of spread of the tumor must of necessity be carried out if a cure is to be effected. Of no less importance is the surgeon's familiarity with the blood supply of the colon, the rectum and the anal canal, both normal and variations of the normal, in order to avoid needless and undesirable operations. Such knowledge may obviate creation of an abdominal colostomy when inadequate mobilization and seeming compromise of blood supply prevent re-establishment of continuity by end-to-end anastomosis. Operations may be performed on lesions of the lower bowel with preservation of the anal sphincters when based on sound and proved anatomic as well as pathologic studies.

In the following concise description of the anatomy of the colon, the rectum and the anal canal and contiguous structures an effort has been made to emphasize important points and to correlate them with clinical values and technical aspects of cancer surgery.

In order to avoid recapitulation, detailed descriptions have been omitted from this discussion, since these subjects have been discussed under their particular heading. This is particularly true of the surgical anatomy and the histology of the anal canal and the lower rectum in relation to squamous cell carcinoma (Chap. 3), and of the lymphatic drainage pertinent to lymphadenectomy (Chap. 1), etc.

EMBRYOLOGY

Colon. The colon is that part of the large intestine derived from the postarterial midgut and hindgut. At about the 10th week of gestation, the midgut returns into the intraembryonic coelom in the so-called physiologic reduction of the fetal umbilical hernia. The postarterial midgut rotates in such a manner that the developing cecum lies under the right lobe of the liver, and the transverse colon lies across the root of the superior mesenteric artery. With further rotation the cecum descends along the right flank, and the dorsal mesentery of the cecum, the ascending colon, the hepatic and the splenic flexures and the descending colon become fused to the posterior body wall.

CLINICAL SIGNIFICANCE AND SURGICAL ASPECTS. Arrest of the normal progress of rotation obviously will lead to an abnormal location of right colon lesions. Thus, arrest of the cecum, which is the seat of a palpable tumor in the infrahepatic region, may lead to confusion in diagnosis. A barium enema x-ray study usually will provide the diagnosis. Incomplete rotation of the colon presents no technical difficulty, provided that the anomaly is recognized. The basic principle of adequate removal of all tissues that may be involved by tumor metastasis should be observed. Particular attention should be given to the vascular pattern, for in addition to other distortions of the anatomy, variations in the blood supply may be present also.

Rectum and Anal Canal. The rectum is derived from the dilated subterminal portion of the hindgut. Its development is closely related to that of the external genital apparatus. The anal canal is derived from the primitive proctodeum, which is of ectodermal origin. At about the 12th week, the anal membrane is completely absorbed, with the result that the rectum communicates with the exterior.

CLINICAL SIGNIFICANCE. Owing to its endodermal and mesodermal origin, the rectum may be the site of both epithelial (adeno-

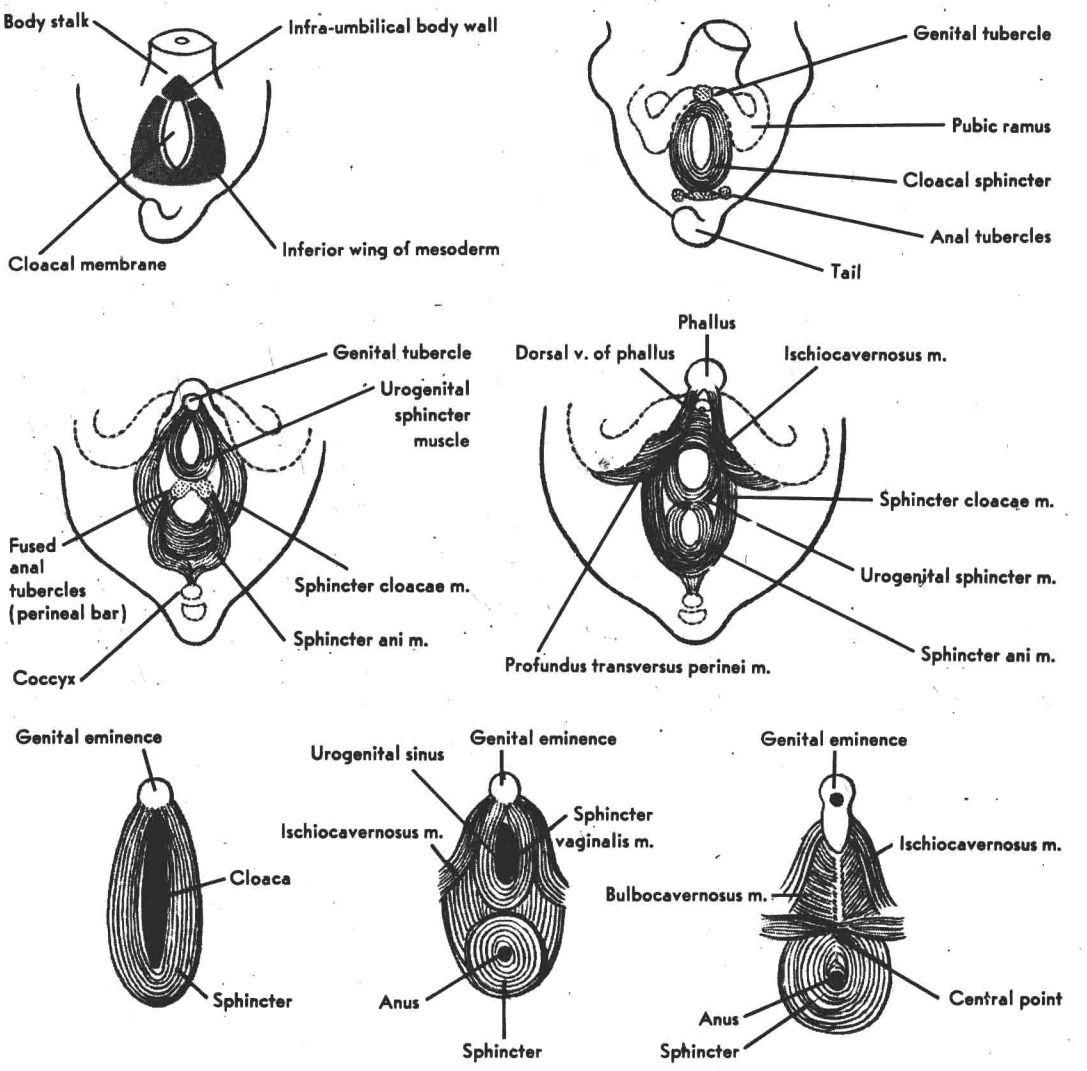

FIG. 1. Embryology. Evolution of perineal musculature. (Bacon, H. E., and Recio, P. M.: Surgical Anatomy of the Colon, Rectum and Anal Canal, Philadelphia, Lippincott)

carcinoma) and connective tissue (sarcoma) tumors. The anal canal, being of ectodermal derivation, gives rise to squamous cell carcinomas only. Squamous cell carcinoma of the rectum has been reported, and this is explained by the cephalad course of the anal ducts and the genesis of these tumors from the transitional epithelium lining these ducts (see Chap. 6). Similarly, adenocarcinoma has been observed in the anal canal, and this is explained by direct extension downward of a carcinoma of the anorectal junction or from perianal ducts and by implantation following anorectal procedures.

GENERAL CONSIDERATIONS

The colon is that segment of the large intestine extending from the end of the ileum to the rectosigmoid junction at the level of the 3rd sacral vertebra. It is arbitrarily divided into the following parts: the cecoappendiceal region, the ascending, the hepatic or right colic flexure, the transverse, the