

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 novice 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 resection 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 phlebotrombosis 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

1. SURGICAL ANATOMY	1
Embryology	1
General Considerations	2
Blood Supply of Colon, Rectum and Anal Canal	21
Lymphatic Drainage of Large Bowel	36
Nerve Supply of Large Bowel	42
2. SURGICAL PHYSIOLOGY OF THE COLON AND THE RECTUM	48
Absorption	48
Digestion	49
Motility	50
Excretion	50
3. ETIOLOGY OF CANCER	54
Physical Factors and Cancer	54
Congenital Factors and Cancer	55
Chemical Carcinogens and Cancer	55
Irradiation and Cancer	58
Heredity and Cancer	59
Hormones and Cancer	60
Viruses and Cancer	61
4. SECTION A: BENIGN AND POTENTIALLY MALIGNANT LESIONS OF THE COLON AND THE RECTUM	69
Definition	69
Classification	70
SECTION B: JUVENILE POLYPS	111
Incidence	111
Pathogenesis	114
Pathology	116
Symptoms	119
Diagnosis	120
Treatment	121
SECTION C: VILLOUS TUMORS (PAPILLARY ADENOMAS)	125
History	125
Terminology	125
Incidence	126
Pathogenesis	128
Pathology	130
Clinical Features	134
Diagnosis	138
Prognosis	139
Treatment	139
SECTION D: DIFFUSE FAMILIAL ADENOMATOSIS OF THE COLON AND THE RECTUM	146
Synonyms	146
History	147
Incidence	149
Pathogenesis and Pathology	153

4.	SECTION D: DIFFUSE FAMILIAL ADENOMATOSIS OF THE COLON AND THE RECTUM—(<i>Continued</i>)	
	Symptoms	160
	Diagnosis	161
	Differential Diagnosis	162
	Treatment	163
	SECTION D-1: PEUTZ-JEGHERS SYNDROME	173
	History	173
	Incidence	174
	The Syndrome	175
	SECTION D-2: GARDNER'S SYNDROME	180
	History	180
	Incidence	184
	The Syndrome	185
	SECTION D-3: SYNDROME OF POLYPOSIS, PIGMENTATION ALOPECIA AND ONYCHOTROPHIA	188
	SECTION D-4: SYNDROME OF POLYPOSIS OF THE COLON AND MULTIPLE HEREDITARY CARTILAGINOUS EXOSTOSIS	190
	SECTION D-5: SYNDROME OF FAMILIAL POLYPOSIS OF THE COLON AND MALIGNANT TUMORS OF THE CENTRAL NERVOUS SYSTEM	191
	Summary	191
	SECTION E: PSEUDOPOLYPOSIS	198
	Incidence	198
	Pathogenesis	198
	Microscopic Pathology	198
	Potential for Malignancy	200
	Treatment	203
	Summary	204
	SECTION F: MALIGNANCY SUPERIMPOSED ON BENIGN ANORECTAL PATHOLOGY	206
5.	SECTION A: INCIDENCE AND DISTRIBUTION OF CANCER	207
	Age	207
	Sex	210
	Race	211
	Location of the Cancer	212
	Circumferential Involvement	214
	SECTION B: MULTIPLE PRIMARY MALIGNANT NEOPLASMS	217
	Incidence	218
	Distribution	219
6.	PATHOLOGY OF CANCER	226
	Classification	226
	SECTION A: ADENOCARCINOMA	227
	Polypoid or Fungating Carcinoma	227
	Ulcerating or Excavating Adenocarcinoma	227
	Carcinomatous Polyp or "Malignant Adenoma"	228
	Villous or Papillary Adenocarcinoma	228
	Scirrhus: Diffuse Infiltrating Adenocarcinoma (Linitis Plastica)	230
	Mucoid Carcinoma	232
	Krukenberg Tumor	239
	SECTION A-1: GRADING OF TUMORS	244
	Mural Penetration and Lymphatic Metastasis	244
	Cellular Differentiation	245

6. PATHOLOGY OF CANCER—(Continued)

SECTION A-2: METASTASIS: MODE OF SPREAD OF CARCINOMA OF THE COLON AND THE RECTUM	248
Local and Direct Invasion	248
SECTION A-3: METASTASIS: IMPLANTATION	257
Peritoneal Implantation	257
Implantation in Operative Wounds	270
SECTION A-4: METASTASIS: LYMPHATIC SPREAD	271
Penetration of Cancer Cells into the Lymphatics	272
Transportation of Cancer Cells	273
Correlation of Metastases to Factors of Spread	275
Changes in Involved Nodes	282
Distant Lymphatic Invasion	283
Retrograde Nodal Metastases	284
SECTION A-5: BLOOD VESSEL INVASION	287
Mode of Entrance and Establishment of Tumor Cells in the Vessels	287
Anatomic Considerations	288
Incidence of Venous Invasion	288
Correlation of Factors to Venous Spread	289
Cancer Cells Circulating in the Blood	290
Visceral Metastases	292
SECTION B: CARCINOID TUMORS OF THE RECTUM AND THE COLON	317
History	317
Incidence	318
Pathology	320
Biochemistry	324
Prognosis	324
Clinical Features	324
Diagnosis	325
Treatment	325
SECTION C: CANCER OF THE ANAL CANAL	332
Malignant Neoplasms of the Anal Canal	332
Anatomy, Embryology and Histology of the Anal Canal	332
Predisposing Factors To Be Considered in the Etiology of Malignancy of the Anorectum, Particularly the Anal Canal and the Anal Margin	335
Squamous Cell (Epidermoid) Carcinoma	340
Adenocarcinoma of Anal Canal	343
Mode of Spread	346
Surgical Anatomy of the Lymphatic System	349
Metastases	353
Symptoms	361
Diagnosis	361
Treatment	361
Basal Cell Carcinoma	368
SECTION D: SARCOMA	380
Malignant Lymphoma of the Colon and the Rectum	380
Leiomyosarcoma of the Colon and the Rectum	384
Fibrosarcoma	388
Rhabdomyosarcoma	392
Angiosarcoma	394
RARE POTENTIALLY MALIGNANT AND MALIGNANT TUMORS OF COLON, RECTUM AND ANAL CANAL	400
Malignant Granular Cell Myoblastoma	400
Hemangiopericytoma	406

6. PATHOLOGY OF CANCER—(Continued)	
SECTION E: MALIGNANT MELANOMA	408
Historical Data	408
Incidence	408
Causes	408
Pathologic Features	409
Clinical Features	412
Treatment	413
Prognosis	414
7. SYMPTOMS	417
Duration of Symptoms	417
Responsibility for Delay in Diagnosis	419
General Considerations	420
Symptoms According to Stages	421
Symptoms According to Location of the Tumor	421
Other Symptoms	425
8. DIAGNOSIS	430
History	431
Physical Examination	431
Proctosigmoidoscopic Examination	434
Roentgenographic Examination	439
Biopsy	443
Pancolonoscopy or Endoscopic Examination of the Entire Colon	444
Exfoliative Cytology	444
Laboratory Examinations	447
9. DIFFERENTIAL DIAGNOSIS	454
Intrinsic	454
Extrinsic	475
10. FACTORS INFLUENCING PROGNOSIS, INCLUDING COMPLICATIONS FOUND PRIOR TO DEFINITIVE SURGERY	479
Age	479
Sex	479
Duration of Symptoms	479
General Debility	480
Loss of Weight	480
Obesity	480
Location of Growth	480
Size of Growth	481
Adherence, Fixation, Invasion	481
Encirclement	483
Type of Malignant Neoplasm	483
Gradation of the Tumor	483
Hemorrhage	484
Obstruction	484
Perforation	489
Cancer Cells, in Peripheral Blood	491
Influence of Antibiotics on Tumor Spread	492
Surgical Extirpation and Its Extent	492
Associated Pathologic and Physiologic Conditions Bearing Influence on Prognosis	492

11. PREOPERATIVE AND POSTOPERATIVE TREATMENT	497
Preoperative Treatment	497
Intraoperative Care	504
Postoperative Management	505
Summary of Orders	507
12. ANESTHETIC MANAGEMENT IN SURGERY OF CARCINOMA OF THE COLON, THE RECTUM AND THE ANAL CANAL	511
<i>Sherman C. Meschter, M.D.</i>	
Preoperative Evaluation and Preparation	511
Preanesthetic Medication	514
Choice of Anesthetic Agent and Technic	515
Regional Anesthesia	516
General Anesthesia	521
Transfusion Therapy, Measurement of Blood Loss and Plasma Volume Support	523
Anesthetic Management in Special Circumstances	525
13. FACTORS PERTINENT TO SURGICAL MANAGEMENT FOR CARCINOMA OF THE COLON, THE RECTUM AND THE ANAL CANAL	529
General Considerations	529
Indications for Resection	531
Contraindications to Resection	531
Operability and Resectability	531
Operative Death	533
Multiple-Stage or Graded Operations	534
The Abdominal Colostomy: Temporary or Permanent, Preliminary to or Concomitant With Definitive Surgery	534
Influencing Factors and Their Assessment in Determining Resectability	536
Handling of the Primary Tumor: Its Protection and Occlusion in Prevention of Contamination, Implantation and Desquamation	537
Early Ligation of Major Vessels Concomitant With Curative Resection	544
Rationale of Lymphadenectomy Concomitant With Curative Resection	549
Rationale of Prophylactic Bilateral Oophorectomy Concomitant With Curative Resection	571
Resection: Radical or Extended, and Ultraradical	573
Critical Appraisal of Ultraradical Resection for Invasive Carcinoma of the Rectum, Involving Adjacent Organs and Structures	578
Rationale of Partial Hepatectomy for Metastatic Carcinoma From the Colon and the Rectum	586
Reoperation or Abdominal Re-entry (Second Look) for Asymptomatic Cancer of the Colon and the Rectum	587
Re-resection for Recurrent Cancer of the Colon, the Rectum and the Anal Canal	588
Palliative Resection for Primary Cancer of the Colon and the Rectum in the Presence of Liver and Lung Metastases	597
Pregnancy Complicating Cancer of the Rectum	603
Management of Peritoneal Floor or Diaphragm: Nonsurgical Reperitonealization	611
14. SURGICAL EXTIRPATION OF THE COLON FOR CARCINOMA	622
History	622
Intra-abdominal Resection of Primary Neoplasm	623
Colectomy	625

14. SURGICAL EXTIRPATION OF THE COLON FOR CARCINOMA—(Continued)	
Subtotal Coloproctectomy With Transverse Coloanostomy and Preservation of the Anal Sphincters Muscles—One Stage	648
Extent of Surgical Excision for Carcinoma in Various Segments of the Colon	653
Resection of Right Colon	653
Resection of the Transverse Colon	662
Resection of Splenic Flexure	667
Resection of the Descending Colon	670
Resection of Sigmoid Colon	673
Rectosigmoidectomy—Low Anterior Resection	679
Minimal Requirement of Bowel Length Below Tumor for Anastomosis	692
Excision of Rectosigmoid With Permanent Abdominal Colostomy (Hartmann)	692
Evolution of Methods To Eliminate Colostomy	699
Abdominoperineal Proctosigmoidectomy Without Colostomy and With Preservation of Sphincter Musculature	704
One-Stage Abdominoperineal Excision of the Rectum With Permanent Single-Barreled Colostomy	730
Synchronous (2-Team) Combined Abdominoperineal Excision of the Rectum (Lloyd-Davies)	742
Radical Panhysterectomy Concomitant With Abdominoperineal Excision and Aortoiliopelvic Lymphadenectomy Without Posterior Wall Vaginectomy	746
Viscerezectomy of the Pelvis	751
Aorto-iliopelvic Lymphadenectomy	760
Transabdominal Colotomy and Polypectomy	766
Radical Ilio-inguinofemoral Lymph Node Dissection for Epidermoid Carcinoma of the Anal Canal	770
Local or Partial Excision	773
Electrosurgery	774
15. COLOSTOMY AND ENTEROSTOMY	784
History	784
PART I. COLOSTOMY	786
Indications	786
Advantages	786
Disadvantages	786
Cecostomy (Typhlostomy)	787
Transversecolostomy	788
Umbilical Colostomy	791
Sigmoidostomy or Left Inguinal Colostomy	791
Perineal Colostomy	794
End-Colostomy: Permanent Single-Barrel	794
Protruding Colostomy Stoma Versus Surface Colostomy	795
Mortality Following Colostomy	796
Complications	797
Management of the Colostomy	802
Short-Circuiting Procedures: Internal Decompression	804
PART II. ENTEROSTOMY; ILEOSTOMY	806
History	806
Indications for Ileostomy Alone	807
Requirements for Satisfactory Ileostomy	807
Types of Ileostomy	807

15. COLOSTOMY AND ENTEROSTOMY—(<i>Continued</i>)	
PART II. ENTEROSTOMY; ILEOSTOMY—(<i>Continued</i>)	
Selection of Site for Ileostomy	809
Circular Stab-Wound Incision	809
Site of Ileostomy in Relation to Exploratory Incision and Scars	810
Length and Diameter of Ileostomy in Relation to Abdominal Opening	810
Suture Material and Its Placement	810
Single-Barrel, Terminal or End Ileostomy	810
Complications Following Ileostomy Alone	815
Prolapse of the Ileostomy	817
Fistula Formation	819
The Ileostomy Bag	820
The Patient and His Ileostomy Life	826
Ileostomy Care	829
General Adaptation to the Opening or Stoma	830
Cements	831
Deodorants	831
Solvents	832
Skin Preparations	832
Permanent Jejunostomy	832
16. OPERATIVE AND POSTOPERATIVE COMPLICATIONS PERTINENT TO RESECTION:	
INCIDENCE, PREVENTION AND MANAGEMENT	845
Cause of Death	845
Shock as Complication	845
Injury to Organs and Structures	849
Infection as Complication	857
Intestinal Obstruction	866
Inhibition Ileus	867
Dynamic Ileus	870
Mechanical Intestinal Obstruction and Peritonitis	872
Strangulation Obstruction	873
Phlebothrombosis, Thrombophlebitis and Pulmonary Embolism	874
Pulmonary Atelectasis	880
Pneumonia	881
Genitourinary Complications	881
Urinary Infection	886
Impotence	886
Wound Dehiscence	886
Hiccup (Singultus)	888
Early Ambulation	889
Latent Perineal or Sacral Hernia	889
17. RADIATION THERAPY IN CANCER OF THE COLON, THE RECTUM AND THE ANUS	895
<i>Robert Robbins, M.D.</i>	
<i>and</i>	
<i>Martha E. Southard, M.D.</i>	
Evaluation of Results	895
Natural History	896
Survival After Radiotherapy	896
Palliation in Rectum and Rectosigmoid Carcinoma	898
Prophylactic Preoperative Radiotherapy	898
Summary	900

17. RADIATION THERAPY IN CANCER OF THE COLON, THE RECTUM AND THE ANUS	
—(<i>Continued</i>)	
Cancers of the Anus	901
Reactions and Complications of Radiotherapy of Anal Cancer	901
Conclusions	901
18. PALLIATIVE THERAPY FOR THE PATIENT WITH INOPERABLE CANCER	903
Radiation Therapy	904
Electrosurgery	907
Management of Intractable Perineal Pain	907
Chemotherapy	908
Types of Agents	911
Clinical Application	914
Pelvic Perfusion	922
Infusion	923
Summary	923
INDEX	929

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 mid-

gut and hindgut. At about the 10th week of gestation, the midgut returns into the intra-embryonic 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-

2 Surgical Anatomy

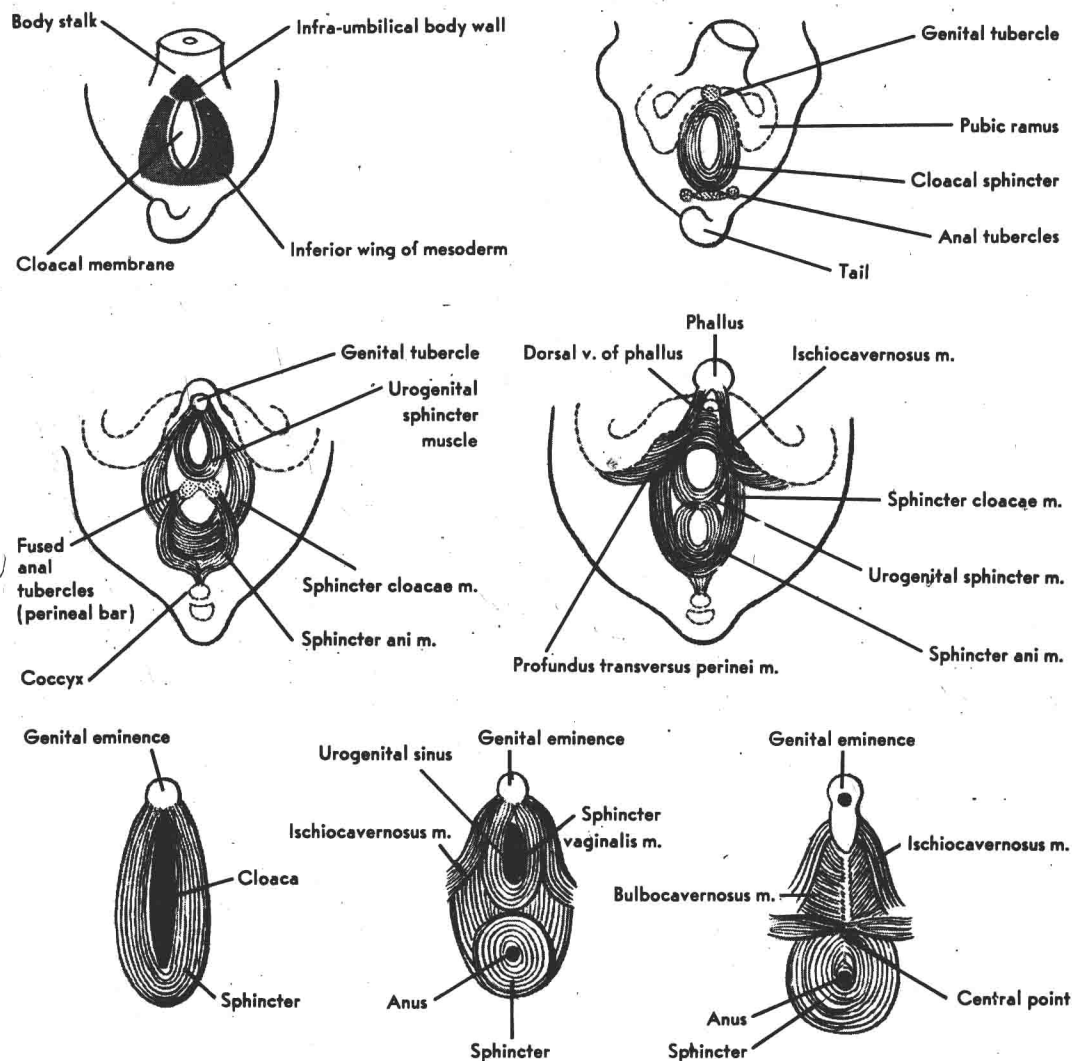


FIG. 1. Embryology. Evolution of perineal musculature. (Bacon, H. E., and Recio, P. M.: *Surgical Anatomy of the Colon, Rectum and Anal Canal*, Philadelphia, Lippincott)

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 extensile 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 ceco-appendiceal region, the ascending, the hepatic or right colic flexure, the transverse, the