Complications of COLON AND RECTAL SURGERY Prevention and Management

FERRARI · RAY · GATHRIGHT

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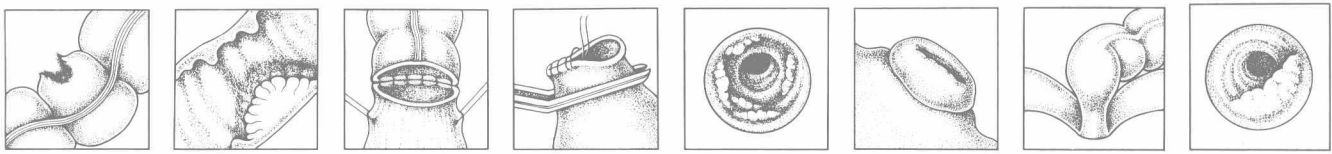

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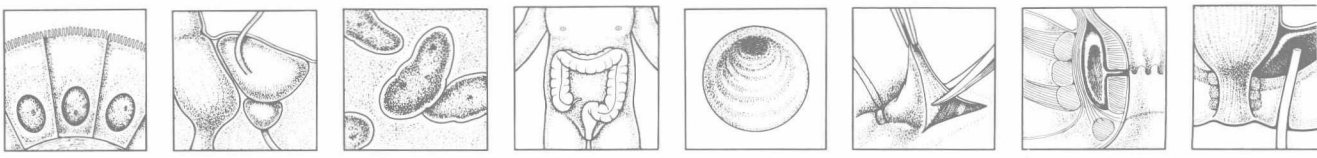

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DEDICATION

To my mother and father for their guidance in the past. To my wife, Linda, for her encouragement in the present.

B.T.F.

To my mentors and lifelong colleagues, Merrill O. Hines, Patrick H. Hanley, and the late Alton Ochsner, with respect, appreciation, and affection.

J.E.R.

To my father, the most honest, uncompromising man I have ever known. I remember him with love and respect each day.

J.B.G.

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FOREWORD

Drs. Ferrari, Ray, and Gathright and their highly qualified collaborating authors have addressed a variety of colorectal topics of interest to every abdominal surgeon. In the first four chapters the authors present the systemic abnormalities that must be corrected before, and prevented after, operation. Then in a series of 12 chapters they describe in detail the common problems that may arise during the management of a wide range of traumatic injuries and benign and malignant diseases of the colon and rectum.

Operations on the lower alimentary tract unfortunately provide a fertile field for the development of postoperative complications that when mild at the least prolong convalescence but when severe become life threatening. An administrative physician in a large city once told me that in his experience operations on the anus and rectum were more poorly performed than any other procedure and that he had seen more patients incapacitated by unskilled surgery in this region than in any other part of the body.

This volume presents a detailed discussion of the significant complications in this field of surgery, including problems resulting from fairly recent innovations such as colonoscopy and intestinal staplers. Not only are complications addressed per se but, even more important, information is also provided that will enable the surgeon to prevent complications and minimize the necessity of managing these difficulties in the postoperative period.

Certainly, colorectal surgery is a demanding field wherein proper preparation of the patient, skilled execution of the operation, and careful postoperative management may make the difference between a gratified patient and a surgical cripple. The authors of this book have used a very practical, "how-I-do-it" approach oriented toward giving us the personal concepts and methods that they have developed during their extensive, specialized experience in the field of colon and rectal surgery.

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PREFACE

Our purpose in assembling this text is not to add to the list of many excellent works that either elucidate the scientific foundations or describe the technical maneuvers that define colon and rectal surgery. Rather, we have attempted to create a text that stresses surgical judgment pertaining to the complications of colon and rectal surgery, with the inclusion of scientific data and technical descriptions relevant to that aim. Surgical judgment is difficult to convey in written form. In attempting to accomplish our task, we took a cue from the many excellent postgraduate courses offered at various surgical forums. During these courses, we witnessed a lively and valuable interchange between speakers and audiences. Obviously, we cannot capture that entire exchange in a text, but we have selected authors who have participated actively in such programs. We asked the authors to stress their personal approaches to the complications of colon and rectal surgery, to highlight the common pitfalls that lie in wait for the surgeon, and to describe their strategies for avoiding these pitfalls.

By utilizing this approach, the text reflects personal biases more than other works. We hope that this method will provide initial guidance to the less experienced surgeon who may be facing certain colon and rectal diseases for the first time, and stimulation for thought to the more experienced surgeon who may already have firm opinions regarding the author's subject. There was one exception to this approach. In discussing the subject of anorectal abscess-fistula, we decided that because there were two distinct approaches to classification and treatment, one more commonly identified with our British colleagues and the other embraced by many American surgeons, we needed to include two chapters on the subject to provide a valuable comparison.

The challenges of avoidance and treatment of complications toll heavily on every surgeon's energies. Possibly, by relating their own experiences, the authors of this text have aided their colleagues in facing these challenges.

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The three editors of this text are only minor actors in its completion. The numerous authors have labored intensely. Medical illustrators have given life to the written words with their drawings. Barbara Siede, Ochsner Medical Illustrator, has been a constant source of expert opinion. Also, Marion Stafford, Ochsner Medical Editor, has read every word of the text and has somehow cheerfully and repeatedly aided many of the contributors in expressing their ideas more concisely. Every project requires someone to keep all the efforts organized. Ann Berni from our office did this especially well and deserves our praise.

All the personnel at W. B. Saunders have toiled endless hours in their efforts. Barbara Cohen deserves the highest praise. She believed in our goals, and without her constant encouragement and guidance, none of this would have been possible.

BERNARD T. FERRARI
JOHN E. RAY
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CONTENTS

Chapter One

METABOLIC AND PHYSIOLOGIC COMPLICATIONS OF COLON AND RECTAL SURGERY

John C. Bowen, M.D.
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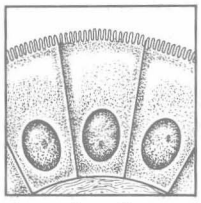

This chapter will review the common metabolic and physiologic complications of colon and rectal surgery and suggest a practical approach to diagnosis and treatment. Although a few of the complications discussed in this chapter are unique to the specialty, most are found in other areas of surgery as well.

FLUID AND ELECTROLYTE IMBALANCE

A detailed working knowledge of fluid and electrolyte balance is essential to the safe practice of colon and rectal surgery. In addition to the relatively simple task of prescribing routine postoperative intravenous fluid therapy, the surgeon may be challenged by the task of restoring the "milieu intérieur" in patients with such complicated conditions as mechanical obstruction of the bowel, paralytic ileus with prolonged nasogastric suction, excessive losses from small bowel fistulae or ileostomies, or severe sepsis, and in those patients undergoing total parenteral nutrition.

The simplest way of calculating the fluid and electrolyte demands of each patient is to think in terms of *maintenance* needs and *replacement* needs. Maintenance fluid refers to the amount of fluid and electrolytes required to ensure normal homeostasis. On the other hand, replacement fluids are calculated to replenish abnormal losses. Both of these may be calculated separately and then added together to get a final figure for the daily orders. The needs of each patient must be individualized and constantly reassessed. For the normal fasting adult patient (average body surface 1.73 m^2), daily maintenance needs are usually met by ordering 2.4 liters (100 ml/hr) of 5 per cent dextrose in quarter normal saline to which is added 60 mEq of potassium (mEq K+). These volumes will ensure moistening of the respiratory tract, maintenance of normal body temperature, and production of enough urine, at least 600 ml to 800 ml daily, to excrete waste products.[1] These maintenance needs may be less in thin, elderly patients and in postoperative patients during the first 24 to 48 hours, which is a period of obligatory sodium and water retention.[2] On the other hand, fever and increased respiratory rate will increase losses by sweating and respiration, respectively. A temperature of 39°C with a respi-

ratory rate of between 30 and 40 per minute will increase sweat and pulmonary water loss (insensible losses) from the normal 750 to 1000 ml per day up to approximately 2 liters. Fluid requirements are increased by approximately 10 per cent of calculated insensible water loss per Centigrade degree, or 7 per cent calculated insensible loss for each Farenheit degree.[1] Moreover, the catabolic patient may need to produce up to 1500 ml of urine daily to excrete waste products. On the whole, however, maintenance needs are fairly predictable and easily gauged by maintaining adequate urinary output.

When there is neither abnormal fluid loss nor inappropriate sodium retention, 100 mEq of sodium and 60 mEq of potassium will meet daily electrolyte requirements. In fact, a normal person deprived of all electrolyte intake can reduce sodium excretion to virtually zero and potassium excretion to a few mEq of potassium per day.[3] However, during stress of illness and surgery, such exquisite renal function cannot be safely assumed. Therefore, sufficient electrolytes must be administered to maintain homeostasis.

To the basic maintenance requirements must be added water and electrolytes that have been lost, for example, removed by nasogastric suction, lost through a small bowel fistula or ileostomy, or collected in distended loops of obstructed bowel (sensible losses). Although some of these losses can be measured accurately in any modern hospital, others must be estimated.

Two factors must be taken into consideration when calculating replacement needs, namely, restoration of volume and correction of electrolyte deficiencies. To illustrate how replacement needs are assessed, consider the complex fluid and electrolyte disturbances that accompany intestinal obstruction. Each patient thought to have a bowel obstruction should be evaluated initially by history, physical examination, and simple tests in an attempt to elucidate the type of obstruction and to obtain some idea of the extent of deficit already present. A patient with a two-hour history of colicky abdominal pain and minimal distension will require less immediate replacement than one who has languished at home for days and acquired a tense distension of the abdomen. Even though the distention is mostly gaseous, large amounts of water and electrolytes are lost into the bowel lumen and must be taken into consideration. The patient with constant severe abdominal pain together with other features of obstruction probably has a strangulating lesion, with additional loss of serum and blood into the affected segment.

The potential for water and electrolyte sequestration is clearly greater in the so-called low ileal obstruction than in the high jejunal one. The high jejunal obstruction is characterized by profuse vomiting of bilious material with minimal abdominal distension and by a relative paucity of bowel loops as seen on abdominal radiographs. By contrast, the patient with low ileal obstruction will develop crampy abdominal pain followed hours to days later by the vomiting of bilious and later feculent material. Radiographs of the abdomen show numerous loops of small bowel with air-fluid levels arranged in a step-ladder configuration.

These distinctions thus do more than satisfy academic curiosity. The physiologic deficits may be different depending on the level of obstruction and must be distinguished in order to resuscitate the patient accurately.

It behooves the surgeon to plan a deliberate and efficient approach to resuscitation. The first step is to establish parameters that may be used to monitor efficacy of treatment. Serial serum electrolytes, particularly serum K^+, together with frequent acid-base assessment, provide the physician with a satisfactory guide to electrolyte status. However, since most potassium is intracellular, the serum potassium does not necessarily reflect the full extent of total body potassium depletion. Hence, patients with a long history of vomiting, intestinal distension, diarrhea, or the taking of potassium-losing diuretics may have a greater total body deficit of potassium than indicated by serum levels, and replacement must be continued until the serum potassium rises to and remains within normal limits.

In an uncomplicated case of paralytic ileus, the appropriateness of volume replacement may be assessed by measuring urinary output together with daily estimation of serum electrolytes.[4,5] However, the acutely ill elderly patient with mechanical intestinal obstruction is better managed by insertion of a central venous catheter and, in the more severe cases, a Swan-Ganz pulmonary artery catheter. Repeated measurement of the central venous pressure, or more reliably the pulmonary capillary wedge pressure, provides the physician with the best method of de-

termining volume status and of avoiding the dangers of under- and overhydration. With accurate monitoring of volume replacement, adequate rehydration may be accomplished within hours, while the patient is prepared for surgery (Table 1–1).

The question arises, which intravenous fluids should be given? In a high jejunal or duodenal obstruction, up to 6 liters of salivary, gastric, biliary, and pancreatic juices may be lost every day (Table 1–2). Analysis of the electrolyte content of the vomitus or aspirate usually reveals high sodium and chloride contents, minimal potassium concentration, and variable amounts of hydrogen or bicarbonate ions. Fortunately, the capacity of the normal kidneys to correct the acid-base imbalance is usually more than adequate, provided the water deficit is replaced and the chloride and potassium deficits are corrected.[6] The electrolyte imbalance commonly associated with a high obstruction is hypokalemic hypochloremic alkalosis with normal or even high serum sodium, depending on the degree of dehydration and the relative loss of each cation. Hypokalemia is due to three factors: (1) loss of potassium in the vomitus, (2) a shift of potassium into cells to compensate for shift of hydrogen ions out of cells, and mainly (3) renal excretion of potassium. The latter is in part an indirect result of the hypochloremia.[7] Chloride ions are normally required for so-

Table 1–1. PREPARATION OF AN OBSTRUCTED PATIENT FOR OPERATION

	Procedure	Purpose
1.	Insert nasogastric tube and aspirate.	To decompress the stomach and bowel, remove risk of aspiration of gastric contents, and assess character of fluid.
2.	Start IV with normal saline.	To replenish volume and salt deficit.
3.	Draw blood for serum electrolytes, CBC, and to cross match blood.	To estimate and monitor fluid and electrolyte status. Add potassium to fluid therapy as necessary.
4.	Insert urinary catheter.	Provides good guide to adequacy of fluid replacement preoperatively and during operation.
5.	Insert central venous catheter.	Allows more accurate assessment of volume status to expedite preparation for urgent laparotomy.
6.	Plain abdominal x-rays, upright and supine.	Provides good indication of site of obstruction and risk of perforation.
7.	Arterial blood gases.	Defines the degree of underlying acidosis or alkalosis.
8.	Repeat serum electrolytes.	To assess the accuracy of therapy, in particular to check serum potassium before anesthesia is administered.

Table 1–2. VOLUME AND COMPOSITION OF GASTROINTESTINAL SECRETIONS

	Volume (ml/24 hr)	Na (mEq/L)	K (mEq/L)	Cl (mEq/L)	HCO_3 (mEq/L)
Salivary	1500 (500–2000)	10 (2–10)	26 (20–30)	10 (8–18)	30
Stomach	1500 (100–4000)	60 (9–116)	10 (0–32)	130 (8–154)	
Duodenum	(100–2000)	140	5	80	
Ileum	3000 (100–9000)	140 (80–150)	5 (2–8)	104 (43–137)	30
Colon		60	30	40	
Pancreas	(100–800)	140 (113–185)	5 (3–7)	75 (54–95)	115
Bile	(50–800)	145 (131–164)	5 (3–12)	100 (89–180)	35

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