

Salomone Di Saverio · Fausto Catena · Luca Ansaloni
Federico Coccolini · George Velmahos *Editors*

Acute Care Surgery Handbook

Volume 2

Common Gastrointestinal
and Abdominal Emergencies

Foreword by Kenneth Mattox



WORLD SOCIETY OF
EMERGENCY SURGERY

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Springer

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With deep gratitude I'd like to dedicate this book to the memory of my father, Tito, who recognized my inclinations early on, and who encouraged and supported me in my pursuit of a medical and surgical career. His constant presence in my youth is for me still a model for how to lead my own life. I also wish to thank my mother Gabriella, who has always been the beacon of light guiding me morally and culturally. She remains my mentor in logic and the humanities, sharing the wisdom of her beloved Greek and Latin masters. Last but not least, I am grateful to and dedicate this book to my devoted wife Omeshnie, who is constantly supporting me with patience and love

Salomone Di Saverio

To my parents who served as my life's springboard and to my wife and children who serve as my life's compass

George Velmahos

To my family that tolerates me and my job every day...

Fausto Catena

To my wife Anna

Federico Coccolini

Foreword

This section is called a “fore” “word” meaning editorial comments made about the book, usually by someone who is *not* an editor or author, to give their impression as to what this book is all about. Finally, this honor (and responsibility) is often given to a more senior person in the same field of the editors. In the case of this foreword, each of these traditional historical tasks is fulfilled. And, the author of this foreword considers this to be a unique and honored request, and one which I am humbled to be fill the responsibility to read the whole book, all of its chapters, and to make meaningful reflections on the purpose of this book, make subtle observations, and reflect on what might be missing from the specific chapters included in this book.

This is a fascinating collection of chapters ranging from emergencies of the esophagus, the gastrointestinal tract, including the rectum, and mesenteric ischemia. This book reflects what is undoubtedly the modern thinking in regard to the surgical, GI endoscopic, and radiologist approach to the diagnosis and management of acute surgical conditions of the above organs. In this book, and in today’s best surgical practice, this management is not always operative, and often such standard therapy is more often than not expectant and nonoperative. Such a modern contemporary approach is the antithesis of the training and practice of many of the surgeons of the 1950–1990 time frames, prior to the advent of CT, MRI, ultrasound, IR, advanced procedural endoscopy, minimally invasive laparoscopic surgery, endoluminal suturing, stents, and NOTES. As I

read the chapters, I reflected upon my own medical student and residency training during the years 1960–1973, where the emphasis was on plain abdominal x-rays, palpation, auscultation, percussion, and repeated abdominal examination. Textbooks were composed of very little statistical analysis of treatment modes and contained multiple drawings of the authors' favored procedure, often bearing that surgeons named operation. This book, happily, justifies many of the alternate approaches by presenting evidence-based comparative studies for the reader to analyze.

Observe the title of this book – *Acute Care Surgery*. Sixty years ago, most “surgical” textbooks were very similar and included the width and breath of a surgical practice. The body of knowledge in surgery be it acute, cancer, infections, trauma, or anatomy and physiology was relatively small. Regardless of the modifying words around the word, “surgery,” most surgery textbooks read and looked quite identical. Surgical textbooks began to focus on either specific organs, etiologies, regions of the body, or techniques of surgery, such as breast, colon, cancer, critical care, trauma, burns, cardiac, thoracic, foregut, colon and rectal, pediatric, and on and on. Beginning about 10–15 years ago, surgeons around the world were attempting to define the body of knowledge which requires emergency, urgent, and acute intervention. Turf wars over the exact wording of this product line broke out. Initially “trauma” and to some extent, “emergency medicine” filled the need for textbooks which focused on the areas where acute care was most concentrated. In Europe, the term, “emergency surgery” emerged, while in the United States, the term “acute care surgeon” was selected, although the curricula of these seemingly similar approaches were basically identical. In Japan and in other Asian countries, the terms, both acute and emergency and trauma surgery were often used almost interchangeably or in combination. In each of these areas, both textbooks and specialty societies were created with the favored

descriptive words were those preferred by the organizing leaders of those societies. This lack of international or even regional agreement contributed to the ongoing confusion of just what was the best vernacular to be used for what used to be merely, “general surgery,” has led to some difficulty for “acute care surgeons” to construct an exact “body of knowledge” which encompasses this emerging discipline. For this Volume 2, the authors and editors have focused on the gastrointestinal tract. One might consider that the acute vascular emergencies in the vena cava, iliac veins, abdominal aorta, renal arteries, and portal vein will also be seen emergently by the acute care surgeon. In many locations, the acute care surgeon serves as the diagnostic and operative gatekeeper of the vascular surgeon. Likewise, the acute care surgeon often could benefit from a more detailed description of both laparoscopic and open common duct surgical procedures than appear in these chapters.

The field of “acute care surgery” is rapidly developing a critical mass of surgeons who have claimed this to be their area of practice. Textbooks and surgical journals are appearing to be the written resource of the fundamentals and the research reporting archives of the knowledge and the craft of this surgical discipline. This textbook is one of those resources. Both the trainee and the practitioner of acute care surgery will find this textbook useful and a ready resource for current approaches to surgical emergencies.

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Preface

The World Society of Emergency Surgery (WSES) was established in 2007 and its aim was clearly declared: “The overall goals include the promotion of the specialty of emergency surgery as part of the emerging discipline of acute care surgery via academic exchange in an effort to further training and education as well as translational research in the specialty.”

Since 2011, the core group of Acute Care and Trauma Surgeons, founder members of World Society of Emergency Surgery, had the feeling of a strong need for improving education in the field of Acute Care and Trauma surgery, especially for the younger surgeons or any doctors and professionals approaching for the first time this discipline and the complex management of trauma and Acute Care (nontrauma) patients.

We have therefore had the idea of writing initially a book of *Trauma Surgery*, aiming to offer a practical manual of procedures, techniques, and operative strategies, which was published 2 years ago.

Following this preliminary and successful project, we have decided to proceed further with the project of a comprehensive *Acute Care Surgery* manual, covering the whole aspects of the treatment of Acute Surgical patients, with a worldwide perspective. In different nations and continents the emergency surgical care may vary widely. Being a group of World Emergency Surgeon, we provide suggestions and skills that are valid and therefore can be used everywhere, as well as give a picture of several different options and perspective in Acute Care surgery.

After more than a year of hard work, it is now with great pleasure that we are announcing the completion of our further ambitious project of an *Acute Care Surgery* manual, where most of the renowned Acute Care surgeons and physicians from all over the world have made an appreciated and highly valuable contribution, with the intent not to merely describe in academic fashion the most recent surgical techniques, but rather to suggest the best surgical and/or endoscopic and/or interventional radiology strategies, with the final of keeping the things simple but effective when in treating a patient in Acute Care setting. The contributing professionals are herewith sharing their expertise for achieving a wise clinical judgment and good common sense. This manual represents a real “vademecum,” especially for young physicians and trainees, with the specific aim of giving a fresh view and practical suggestions for best managing Acute patients and improving the skills of their treating surgeons and physicians.

This Volume two of the manual is focused on abdominal and GI emergencies in Acute Care surgery covering the most common diseases of the whole area and offering a careful description of diagnostic procedures, surgical techniques, and nonoperative management. This practical and complete guide stems from the partnership and collaboration between the members of World Society of Emergency Surgery (WSES) and other internationally recognized experts in the field; its aim is to provide general surgeons as well as emergency physicians, gastroenterologists, professionals from many other specialties, residents, and trainees with a complete and up-to-date overview of the most relevant operative techniques and with useful “tips and tricks” for their daily clinical practice.

Once again I thankfully acknowledge the excellent level of scientific quality and educational value of the content that each chapter’s author has contributed. The material received is extremely extensive in terms of quantity and quality that the contents have been apportioned between two volumes.

We are moreover very glad that this project, conducted in cooperation with our World Society of Emergency Surgery and its journal, has truly joined together not only Acute Care surgeons but also surgeons and physicians from other surgical specialties, such as thoracic and vascular surgery, ObGyn, urology, pediatrics, and ENT, as well as gastroenterology, gastrointestinal endoscopy, and interventional radiology, from all over the world sharing our experiences in the management of the acutely ill patients. The multidisciplinary board of authors, editors, and foreword writers of this book is truly international with contributors from the Americas, Europe, Africa, Australasia, and Asia. This is the most heartening and promising signal for a worldwide collaboration.

This is the second of the planned WSES book series, starting the WSES educational program for the next future years. This project aims to link together WSES courses, WSES guidelines, and WSES books to give complete educational tools to the next generation of emergency and trauma surgeons.

WSES is demonstrating to act as the first scientific world society capable to develop a systematic scientific and education program with the aim of science progress according to evidence-based medicine and experience-sharing program among professionals.

I acknowledge the invaluable foreword contributions from two masters Dr. Kenneth Mattox MD FACS and Dr. David Feliciano MD FACS, emanating from their extensive experiences.

Last but not least, I am deeply grateful to the board of Directors of AUSL Bologna for their continuing commitment in improving public health and the care of Acute Surgical patients. Special mention to the Director General of AUSL Bologna Dr. Chiara Gibertoni, the Health Director Dr. Angelo Fioritti, the Administrative Director Dr. AM. Petrini, the Directors of the Department of Emergency Dr. Giovanni Gordini and Department of Surgery Prof. Elio Jovine, and the chief of the Trauma

Surgery Unit Dr. Gregorio Tugnoli. With the contribution and cooperation of all these professionals, an outstanding model of Acute Care Surgery and Trauma Center for a modern and multidisciplinary care of the Acute Surgical patients has been developed in the Province of Bologna, including a functional model of “Hub and Spoke” and a convenient system of tertiary referral care. I am sincerely proud to be part of this exciting multidisciplinary team of AUSL Bologna dedicated to the improvement of Acute Care Surgery model, within a northern Italian province of Emilia Romagna region.

We look forward to a successful and worldwide ongoing cooperation within our international family of enthusiastic Acute Care and Emergency surgeons, aiming to provide a better care for the acutely ill surgical patients.

Bologna, Italy Salomone Di Saverio MD, FACS, FRCS

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Chapter 1

Acute Abdomen: Clinical Assessment and Decision-Making

Fernando Turégano

1.1 Introduction

An acute abdomen is usually defined as an acute abdominal pain of short duration which requires a decision on whether to proceed or not with urgent intervention [1]. All abdominal crises present with one or more of five main symptoms or signs: pain, vomiting, abdominal distension, muscular rigidity, or shock. The severity and the order of occurrence of the symptoms are important for diagnosis, together with the presence or absence of fever, diarrhea, constipation, and others [2, 3]. The presence of tenderness on palpation is a hallmark of potential acute abdominal problem of surgical importance, and it generally implies inflammation of the visceral peritoneum. This tenderness may be accompanied or not by muscular rigidity (*defense guarding* or *guarding*). There are several grades of muscular rigidity, and its elucidation is not always easy on clinical exam, with the exception of the board-like

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rigidity typical of perforated ulcer. This guarding usually implies inflammation of the parietal peritoneum. Sometimes it takes a great deal of clinical acuity and experience to differentiate between voluntary and involuntary guarding. Modern abdominal imaging, interventional radiology, a better understanding of the natural history of many acute conditions, and more effective antibiotic treatments have revolutionized emergency abdominal surgery and certainly improved our decision-making capabilities. CT scan imaging has considerably decreased the challenge of differential diagnosis of the acute abdomen, decreasing also the rate of negative or nontherapeutic abdominal explorations. It has also reduced hospital admission rates and the duration of hospital stays; its overuse, though, should be avoided, especially in the pediatric population [4].

Decision-making should always involve discriminating between urgent and nonurgent causes; patients suspected of nonurgent diagnoses can be safely reevaluated the next day. Antibiotics should be started as soon as sepsis is recognized. Opioid analgesics should not be withheld for fear of affecting the accuracy of physical examination [5].

1.2 Acute Generalized Abdominal Pain with Tenderness

Generalized peritonitis consists of diffuse severe abdominal pain in a patient who looks sick and toxic. The patient typically lies motionless and has a tender abdomen with “peritoneal signs” (rebound tenderness and defense guarding). Surgical management is warranted. The three most common causes of generalized peritonitis in adults are perforated appendicitis, colonic perforation, and a perforated ulcer [1].

The most common causes of colonic perforation are malignancy and acute sigmoid diverticulitis. Colorectal tumors can

perforate in the tumor itself, usually at the rectosigmoid, or at the cecum, after several days of unrelieved complete obstruction in a patient with a competent ileocecal valve. In the latter case, tenderness of the abdomen on the right side may be a sign of impending perforation. Regarding acute diverticulitis, a small number of patients present from the start with diffuse peritonitis, with free intraperitoneal gas on CT scan.

The pain caused by a peptic perforation usually develops very suddenly in the upper abdomen, and most patients present with signs of diffuse peritoneal irritation and tenderness. Spillage of gastroduodenal contents along the right gutter into the RLQ may mimic acute appendicitis and, although very uncommon, can occur in clinical practice (*Valentino's syndrome*). There is free gas under the diaphragm in about two-thirds of perforated patients. Differential diagnosis should also be made at times with diffuse peritonitis from other causes (perforated gallbladder with bile peritonitis and others). An occasional patient with acute pancreatitis may present with a clinical picture mimicking diffuse peritonitis [1], but lab tests and CT scan can help with the diagnosis. In the elderly or not so elderly patient with a known arrhythmia, advanced mesenteric ischemia should be considered; the patient will almost always be clammy, a sign of poor peripheral perfusion typical of the condition at this stage of bowel necrosis.

A CT scan, although not mandatory, is invaluable in confirming the diagnosis and helping decide on the type and extent of laparotomy or whether a laparoscopic approach is warranted.

1.3 Localized Abdominal Pain with Tenderness

The importance of the character of the pain, whether cramping, steady, sharp, etc., cannot be overemphasized. The golden rule is to examine the patient again within 2 or 3 h. In nearly every serious case, there will by that time be some other symptoms,

such as vomiting, fever, or local tenderness, which may point more definitely to the nature of the lesion.

1.3.1 Pain Around the Umbilicus and Epigastrium

It is uncommon in the absence of incarcerated umbilical hernia and omphalitis. Severe epigastric or central abdominal pain with some tenderness may be due to simple intestinal colic, to the initial stage of obstruction of the small intestine, to acute pancreatitis, or even to the initial stages of acute cholecystitis or biliary colic.

1.3.2 RUQ Pain

If the chest is clear (no right basal pneumonia), this is usually due to acalculous acute cholecystitis (AC). RUQ pain and tenderness (*Murphy's sign*) are accompanied by systemic evidence of inflammation (fever, leukocytosis) and usually by a mild or moderate elevation of bilirubin or liver enzymes. There can also be a mild elevation of the serum amylase. Diagnosis is usually confirmed with US. The presence of intramural gas, and gas within the gallbladder lumen (*acute emphysematous cholecystitis*), can be present in AC of diabetic patients. This latter condition should prompt urgent surgical intervention. A laparoscopic cholecystectomy is warranted in most cases within the first few hours or days after diagnosis.

Acalculous acute cholecystitis is a manifestation of the disturbed microcirculation in critically ill patients. Clinical diagnosis can be extremely difficult in that context, and early diagnosis requires a high degree of suspicion, excluding it as a cause of an otherwise unexplained septic state or SIRS. Urgent cholecystectomy or cholecystostomy is warranted.

RUQ tenderness may be also due to acute cholangitis, characterized by *Charcot's triad* (RUQ pain, fever, and jaundice). Disproportionate pain may be due to coexisting AC. In the elderly patient, or when medical intervention is delayed, the syndrome can progress to include confusion and septic shock (*Reynolds pentad*). A typical biochemical panel shows mildly elevated transaminase, variably elevated total bilirubin with a direct preponderance, and a disproportionately elevated alkaline phosphatase and glutamyl transferase. Diagnosis is usually confirmed by US. Interventional biliary decompression by means of ERCP or the transhepatic route should be preferred to surgery and performed as soon as available.

1.3.3 LUQ Pain

The left upper quadrant of the abdomen is least often the site of origin of local peritonitis. Acute pancreatitis is one of the most common causes of pain in the LUQ, often occurring without any epigastric component at all. Vomiting and retching are frequent. A carcinoma or stricture of the splenic flexure of the colon may rarely cause severe localized pain, and constipation will be a common symptom. A left perinephric abscess, the rupture of an inflamed jejunal diverticulum, and the spontaneous rupture of the spleen, all can cause LUQ pain with tenderness [2].

1.3.4 Pain in the Hypogastrium

Hypogastric pain and rigidity in a young or middle-aged man are usually due to appendicitis, while in an older man, an alternative diagnosis would be acute diverticulitis or, infrequently, a rectosigmoid cancer with localized perforation. The same

symptoms in a young woman might be due either to appendicitis or to a gynecological condition.

Acute urinary bladder retention should always be considered in an elderly patient with a history of advanced prostatic, and a tumor mass effect will be felt on palpation. In the pre-US and CT scan era, this condition has been known to lead to an occasional misdiagnosis and abdominal exploration.

1.3.5 RLQ Pain

The most common cause is, of course, acute appendicitis (AA). The different anatomic positions of the appendix may make symptoms and signs variable. Vomiting before the onset of pain should lead to suspicion of a different diagnosis. The occurrence of diarrhea, especially in children, is occasionally misleading. This diarrhea can be caused by a pelvic appendix irritating the rectum by contiguity or irritation by a pelvic abscess. Sometimes, with a perforated iliac appendix lying behind the end of the ileum, the subsequent symptoms of small bowel obstruction may be misleading.

McBurney's point of tenderness corresponds roughly to the position of the base of the appendix, and it is common to find no local muscular rigidity in a case of appendicitis without any peritonitis. Pressure over the LLQ will sometimes cause pain in the appendicular region (*Rovsing's sign*). Fever almost never precedes the onset of pain. A slight tachycardia is a common and helpful sign in cases of doubtful clinical diagnosis. Laparoscopic or open appendectomy is indicated, taking into consideration that perforation in AA is not strictly a time-dependent phenomenon [6]. Conservative management with antibiotics is being advocated now by some groups in Europe. Occasionally, palpation of a mass over the RLQ, together with a clinical picture consistent with appendicitis of several days' duration, should prompt the diagnosis of an *appendiceal phlegmon*. An US or CT scan should rule out an abscess within the phlegmon, in which

case drainage by interventional radiology is indicated. Otherwise, surgery should be contraindicated at this stage.

In the female, acute salpingitis, hydrosalpinx with a twisted pedicle, a ruptured follicular cyst (*mittelschmerz* or pain at mid-cycle), a ruptured *corpus luteum* cyst (pain with the menses), a ruptured pyosalpinx, and a ruptured ovarian endometrioma can be misdiagnosed as AA on clinical grounds. An US is usually of help, and the decision-making process will depend on the specific condition.

1.3.6 LLQ Pain

Acute diverticulitis (AD) of the sigmoid colon is the most frequent cause, and there is sometimes rigidity of the overlying muscular abdominal wall. There may be slight fever, but neither epigastric initial pain nor vomiting. There are signs of systemic inflammation with fever, increased CRP (C-reactive protein), and leukocytosis with left shift. The patient usually has a simple phlegmonous AD or a pericolic abscess, and conservative management is indicated, with interventional percutaneous drainage in large abscesses. When the sigmoid colon is redundant and lies well to the right, confusion with AA can be considerable.

Pain and tenderness in the LLQ may also be due to inflammation around a cancer of the sigmoid colon.

1.4 Acute Abdominal Pain Without Tenderness

1.4.1 Early Acute Mesenteric Ischemia (AMI)

In early AMI the clinical exam is remarkably nonspecific. The patient usually complains of severe abdominal pain, with very

little findings on physical examination, leading the clinician to frequent misdiagnoses of very dire consequences for the patient. *Any patient with an arrhythmia such as auricular fibrillation who complains of severe abdominal pain of sudden onset should be highly suspected of having embolization to the superior mesenteric artery (SMA) until proved otherwise [1].*

In thrombosis, there is usually a history indicating previous abdominal angina, and the patient complains initially of mild central cramping abdominal pain. Frequent bowel movements are common and usually contain either grossly or microscopically detectable blood. It will never be too overemphasized that, in the early stages, physical examination of the process is treacherously benign; peritoneal irritation appears too late, when the bowel is already dead. Laboratory studies usually are normal until the bowel loses viability, when leukocytosis, hyperamylasemia, and lactic acidosis develop. A CT angio is usually very helpful in ruling out embolism or thrombosis to the SMA.

Nonocclusive mesenteric ischemia (NOMI) is due to a low-flow state, in the absence of documented arterial thrombosis or embolus. The low-flow state is often due to a combination of low cardiac output, reduced mesenteric flow, or mesenteric vasoconstriction in the setting of a preexisting critical illness. The condition may involve the entire small intestine and colon, often in a patchy distribution. The clinical picture may be indistinguishable from that of organic occlusion of the mesenteric vessels. *Any patient who takes digitalis and diuretics and who complains of abdominal pain must be considered to have NOMI until proven otherwise.* Chronic renal insufficiency patients on hemodialysis are also prone to this condition.

Mesenteric venous thrombosis is much less common than the previously discussed, and there is commonly an underlying hypercoagulable state or sluggish portal flow due to hepatic cirrhosis. The use of contraceptive pills has been implicated as a pathogenetic factor. The clinical presentation is nonspecific.

Abdominal pain and varying gastrointestinal symptoms may last a few days until eventually the intestines are compromised, and peritoneal signs develop.

Decision-making in AMI may involve interventional procedures, surgical treatment and anticoagulation, alone or combined, and also palliative care.

1.4.2 Pain Radiating to the Back

In a dissecting aneurysm of the aorta, sometimes the patient will come in complaining of an unbearable pain through the back, extending down to the abdomen, and, initially, without any tenderness nor rigidity on palpation. On careful questioning, the pain would have started in the thorax, radiating through to the back. Significant arterial hypertension of prolonged duration is usually a forerunner, and there will almost certainly be differences between an upper- and a lower-limb pulse according to the position of the lesion. Clinical misdiagnosis with a renal colic has not been uncommon in the pre-CT scan era, with dire consequences for the patient.

Leakage or rupture of an abdominal aneurysm is by far a more common cause of abdominal pain than is a dissecting thoracic aneurysm. Any patient with a known aneurysm and recent abdominal pain should be regarded as being in imminent danger of rupture. When present, the pain prior to rupture is of a throbbing (pulsatile) or aching nature, and it is located in the epigastrium or the back. Collapse in a patient with a known aneurysm almost always indicates rupture. Abdominal and flank examination usually reveals a mass representing the extravasated hematoma, and the left flank is the most common site. Time to surgery or endograft is of the essence here, and insistence on a preop CT angio in every case, although invaluable to plan management, still contributes in many deaths.

A postmetecic transmural rent in the distal esophagus (Boerhaave's syndrome) usually presents with pain radiating to the back and no epigastric tenderness. The sequence of vomiting first followed by sharp pain in the back should help in making an early clinical diagnosis and saving the patient's life. Surgical management is usually warranted, but endoscopic procedures do have a role in early cases.

1.5 Nonspecific Abdominal Pain (NSAP)

NSAP is defined as pain lasting a maximum of 7 days for which no immediate cause can be found during the acute admission and specifically does not require surgical intervention. It is a presenting symptom of a large number of minor and self-limiting conditions. It is a diagnosis by exclusion, and up to 10% of patients with NSAP over the age of 50 years have subsequently been found to have an intra-abdominal malignancy. An association between NSAP and irritable bowel syndrome or celiac disease has been described. Women account for about 75% of admissions with NSAP. Compared with active clinical observation, early laparoscopy has not shown a clear benefit in women with NSAP [7].

1.6 Painful Abdominal Wall Swelling

An incarcerated hernia is one of the most common forms of intestinal obstruction, and it is often difficult to make certain whether an hernia is merely incarcerated or whether it is strangulated (with advanced ischemia or necrosis of its content), for pain and constipation are usually present in both cases. With simple incarceration of short duration, though, the pain tends to

be milder than with strangulation. In certain cases there may be little local tenderness to call attention to the hernia.

A strangulated femoral hernia gives rise to more mistakes in diagnosis than a strangulated inguinal hernia. Sometimes only a small knuckle of gut comprising a small portion of the circumference of the bowel may be caught in the femoral canal (*Richter's hernia*), and scarcely any projection may be felt in the thigh. Some of these patients, usually elderly ladies, will be worked up with a presumed diagnosis of intestinal pseudo-obstruction, and a CT scan can confirm an accurate preoperative diagnosis. Inflamed and enlarged inguinal glands produce a more diffuse and fixed swelling, and fever is not uncommon. Vomiting will be absent. They result from a primary cause that may be detected on the corresponding thigh, the penis, or anoperineal region. Ultrasound may be helpful, but, ultimately, only surgical intervention will differentiate between both conditions in some patients. An inflamed appendix in a femoral hernia sac (*Littre's hernia*) cannot be distinguished definitely from a strangulated femoral hernia before operation.

An obturator hernia is very uncommon and most frequently found in wasted, elderly women. Symptoms of obstruction of unknown cause will predominate. The only local symptom may be some pain radiating down the inner side of the thigh along the distribution of the obturator nerve. If the diagnosis is suspected on clinical grounds, something very unusual, rotation of the thigh (*Romberg's sign*) will elicit pain. CT scan is diagnostic.

A rectus sheath hematoma usually manifests itself as a painful abdominal swelling of moderate size and imprecise limits and used to be confused with other acute abdominal conditions of surgical importance in the pre-CT scan era. If discoloration of the skin is already present, together with the typical history of bouts of coughing in a patient on anticoagulation medication, the diagnosis is more straightforward.

1.7 The Postoperative Acute Abdomen

Few clinical situations are as diagnostically demanding as the evaluation of the abdomen in a patient who has undergone an abdominal operation [2]. The key to an early diagnosis of a serious abdominal complication is a frequent daily assessment of the patient. The passage of stool and gas, and also at times resumption of an oral diet, is not always a guarantee that all is well within the peritoneal cavity. Peritonitis that occurs from the fourth to the eighth or ninth postoperative day is almost always caused by an anastomotic disruption. Pain is usually present, and any new pain should be regarded with suspicion. Tenderness and rigidity are usually present but may be so mild as to be misleading. At times signs and symptoms can be so subtle as to represent a real clinical challenge. Occasionally, only the presence of oliguria leads to the suspicion of anastomotic disruption in an otherwise asymptomatic patient. The presence of an unexplained tachycardia, in the absence of fever, or tachypnea, in the absence of atelectasis or pneumonia, should also raise the suspicion of anastomotic disruption. In the latter, many patients are thought to have pulmonary embolus and undergo CT scan and other tests, when in fact the tachypnea is due to the post-op abdominal condition. The decision-making process should always be individualized and surgical revision warranted in many cases, but interventional radiology and therapeutic endoscopy should be considered when deemed appropriate.

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Chapter 2

Diagnostic Tools in ACS: CT Scan, Diagnostic Laparoscopy, and Exploratory Laparotomy

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2.1 Introduction

The abdomen is a black box of diagnostic uncertainty. There is an old surgical adage that goes, “Never let the skin come between you and the diagnosis.” However, it is just that: an old adage. The surgeon has many alternatives to employ in situations in which the clinical diagnosis, or decision to operate, is not straightforward. In this chapter, three primary modalities are discussed: computed tomography (CT) scanning, diagnostic laparoscopy (DL), and exploratory laparotomy (LAP).

2.2 CT Scanning

The CT scan is an exceedingly valuable tool for the diagnosis of essentially any abdominal surgical problem. A CT scan can quickly

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