Acute Abdomen and Acute Abdominal Conditions

15

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15.1 Acute Calculus Cholecystitis

15.1.1 Introduction

The estimated overall prevalence of gallstones is 10–15% in the general population, with some differences across countries. Between 20 and 40% of patients with gallstones will develop gallstone-related complications, with an incidence of 1–3% annually; acute calculus cholecystitis (ACC) is the first clinical presentation in 10–15% of the cases [1, 2]. In 95% of cases ACC is caused by gallstones, while in the remaining 5% of cases it can be associated with cardiovascular disorders, following trauma or severe burns, following abdominal or cardiac surgery, in prolonged fasting typical of critically ill patients, in severe immunodeficiencies, in elderly and diabetic patients [3].

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15.1.2 Diagnostic Criteria for ACC

The useful features for the diagnosis of ACC are:

- History and clinical examination: fever, right upper quadrant pain or tenderness, vomiting or food intolerance; Murphy's sign
- Laboratory tests: elevated C-reactive protein, elevated white blood cell count
- Imaging: signs suggestive of gallbladder inflammation

The Tokyo Guidelines 2013 and 2018 (TG13/TG18) [4, 5] defined an algorithm that allows to better define a suspected or certain diagnosis of acute cholecystitis following 3 diagnostic criteria (Table 15.1).

15.1.3 Which Initial Imaging Technique Should Be Used in Case of a Suspected Diagnosis of ACC?

The generally accepted imaging findings of acute cholecystitis are thickening of the gallbladder wall (≥4 mm), enlargement of the gallbladder (long axis ≥8 cm, short axis ≥4 cm), gallstones or retained debris, fluid accumulation around the gallbladder, and linear shadows in the fatty tissue around the gallbladder [6]. Abdominal US should be the first method of diagnostic imaging used for acute cholecystitis. However, as a causative stone in the gallbladder or bile duct may not always be clearly identifiable on abdominal US and the diagnosis of gangrenous cholecystitis may be difficult [7], it is also recommended that contrast-enhanced CT or MRI be performed if required [8].

15.1.4 Stratification of the Risk and Severity of ACC

The TG13 confirmed by TG18 made it possible to classify ACC according to 3 degrees of severity (mild, moderate, and severe) taking into consideration specific biohumoral and clinical parameters (Table 15.2).

Table 15.1 TG18/TG13 diagnostic criteria for acute cholecystitis [4, 5]

A. **Local signs of inflammation, etc.**
(1) Murphy's sign, (2) RUQ mass/pain/tenderness
B. **Systemic signs of inflammation, etc.**
(1) Fever, (2) elevated CRP, (3) elevated WBC count
C. **Imaging findings**
Imaging findings characteristic of acute cholecystitis
Suspected diagnosis: one item in A + one item in B
Definite diagnosis: one item in A + one item in B + C

Table 15.2 TG ACC severity grading [9]

Grade I Mild	Grade II Moderate	Grade III Severe
Patient with no signs of organ dysfunction and with mild inflammation of the gallbladder	Associated with one of the following conditions: 1. WBC >18,000/mm^3 2. Palpable gallbladder in right hypochondrium 3. Duration of symptoms >72 h 4. Marked local inflammation (gangrenous cholecystitis, liver abscess, biliary peritonitis, cholecystitis emphysematous)	Associated with dysfunction of one of the following bodies: 1. Cardiovascular dysfunction: hypotension that requires dopamine ≥5 μg/kg/min or other vasoactive amines 2. Neurological dysfunction: decrease in the level of consciousness 3. Respiratory dysfunction: PaO_2/FiO_2<300 4. Renal dysfunction: Oliguria, Creatinine >2.0 mg / dl 5. Hepatic dysfunction: PT-INR >1.5 6. Blood dysfunctions: PLT <100,000/mm^3

15.1.5 When ACC Was Associated Common Bile Duct Stones: Which Tools to Use for Suspicion and Diagnosis at Presentation?

Choledocholithiasis, i.e., the presence of common bile duct stones (CBDS), is reported to occur in 10% to 20% of gallstone cases, with lower incidence, ranging from 5 to 15%, in case of ACC [10]. In order to assess the risk for CBDS, WSES guidelines [11] suggest to perform liver function tests (LFTs), including ALT, AST, bilirubin, ALP, GGT, and abdominal US in all patients with ACC. The visualization of a stone in the common bile duct at transabdominal US was a predictor of CBDS in patients with ACC while an increased diameter of common bile duct was an indirect sign of stone presence but was not sufficient to identify ACC patients with CBDS. The American Society of Gastrointestinal Endoscopy and the Society of American of Gastrointestinal Endoscopic Surgeons combined the published validated clinical scores and proposed a risk stratification of CBDS in three different classes, defined as follows: low risk (<10%), moderate risk (10–50%), and high risk (>50%) of CBDS [12] (Tables 15.3 and 15.4). This proposed classification has clear clinical implications: patients with a low risk of CBDS should be operated without further investigation; patients with moderate risk should be evaluated with a second-level examination, either preoperatively with endoscopic US (EUS) or magnetic resonance cholangiopancreatography (MRCP) or intraoperatively with laparoscopic US

Table 15.3 Predictive CBDS factors [12]

Very strong factors	Strong factors	Moderate factors
Evidence of stones in CBDS during ultrasound of the abdomen	• Common bile duct diameter> 6 mm • Total bilirubin >4 mg/dl • Direct bilirubin >1.8–4 mg/dl	• Abnormal liver tests • Age >55 years • Clinical pancreatitis

Table 15.4 Risk classes for CBDS [12]

High risk	Moderate risk	Low risk
Very strong factors presence	Strong and moderate factors presence	No predictive factors

(LUS) or intraoperative cholangiography (IOC), in order to select patients who need stone removal; finally, according to local expertise, laparoscopic transcystic CBD exploration is a valuable option. Patients with high risk of CBDS should undergo pre- or intra- or postoperative endoscopic retrograde cholangiopancreatography (ERCP) depending on local expertise and availability.

CBDS could be removed with several techniques and a variation of timing: preoperative ERCP with sphincterotomy, intraoperative ERCP with sphincterotomy, laparoscopic or open common bile duct exploration, postoperative ERCP with sphincterotomy. A systematic review assessed the differences between these techniques [13]. No differences in terms of morbidity, mortality, and success rate were reported. Therefore, these techniques can be considered suitable options, depending on local expertise and availability.

15.1.6 Surgical Treatment of ACC

The laparoscopic cholecystectomy was recommended as the first-line treatment for patients with ACC [6, 7]. The laparoscopic approach should always be attempted except in cases of absolute anesthetic contraindications or severe hemodynamic instability.

Laparoscopic cholecystectomy in acute cholecystitis was associated with a reduction in mortality rates, infectious complications of the surgical site and pneumonia and a clear reduction in the average postoperative hospital stay, when compared to the traditional open approach [14–16]. The subtotal cholecystectomy is an option when the critical view of safety cannot be obtained. It is preferable to perform a cholecystectomy as soon as possible, after patient admission, preferably within 72 h of the onset of symptoms [4, 5] or in any case within 7 days from hospital admission and within 10 days from the onset of symptoms.

15.1.7 Alternative Treatment for Patients with ACC: Observation and Techniques for Gallbladder Drainage

A RCT with long-term follow-up of 14 years showed that about 30% of patients treated conservatively developed recurrent gallstone-related complications and 60% of patients had undergone cholecystectomy subsequently [17]. TG13 on ACC [6, 7] considered percutaneous transhepatic gallbladder drainage (PTGBD) as mandatory for patients with severe-grade ACC and also suggested its use in the moderate grade if conservative treatment fails. The revised TG18, based on recent studies, proposed that severe-grade cholecystitis, under certain strict criteria, may be treated with laparoscopic cholecystectomy [5, 18]. Gallbladder drainage decompresses the infected bile or pus in the gallbladder, removing the infected collection without removing the gallbladder. Gallbladder drainage may be an option in patients who failed conservative management after a variable time of 24–48 h and who present with strict contraindications for surgery.

15.1.8 Antibiotic Therapy

Biliary penetration of different antibiotics (indicated as the ratio of bile-to-serum concentrations) are listed in Table 15.5 [19], suggested by 2020 WSES update guidelines.

Table 15.5 Antibiotics biliary penetration

Good penetration efficiency antibiotics Bile/Serum (≥5)	Low penetration efficiency antibiotics Bile/Serum (<5)
Piperacillin/Tazobactam	Cefotaxime
Tigecycline	Meropenem
Ciprofloxacin	Ceftazidime
Ampicillin/Sulbactam	Vancomycin
Ceftriaxone	Amikacin
Levofloxacin	Gentamicin
Penicillin G	Cefepime
Amoxicillin/Clavulanate	Imipenem

15.2 Acute Colonic Diverticulitis

15.2.1 Introduction

Acute left-sided colonic diverticulosis is common in Western countries with its prevalence increasing throughout the world, which is likely due to changes in lifestyle [20]. Although left-sided colonic diverticulosis remains more common among elderly patients, a dramatic rise of its incidence has been seen in younger age groups in recent years [21]. Recent evidence suggests that lifetime risk of developing acute left-sided colonic diverticulitis (ALCD) is about 4% among patients with diverticulosis [22].

15.2.2 Which Classification Should Be Used in Patients with ALCD?

A proposal for a CT-guided classification of ALCD was published in 2015 by the WSES acute diverticulitis working group [23] and confirmed by recent update of this guideline [24]. It may guide clinicians in the management of acute diverticulitis and may be universally accepted for day-to-day practice (Table 15.6).

15.2.3 The Diagnosis of ALCD

In patients with suspected ALCD, a complete assessment of the patients using clinical history, signs, laboratorial inflammation markers, and radiological findings was performed. Clinical findings of patients having ALCD include acute pain or tenderness in the left lower quadrant that may be associated with increased inflammatory markers, including C-reactive protein (CRP) and white blood cell count (WBC). CRP has been identified as a useful biomarker of inflammation, and it may be useful in the prediction of the clinical severity of acute diverticulitis as demonstrated by several recent studies [25]. CT is the gold standard for both the diagnosis and the staging of patients with ALCD due to its excellent sensitivity and specificity [26].

Table 15.6 WSES acute diverticulitis classification [24]

Uncomplicated acute diverticulitis	Complicated acute diverticulitis
Stage 0: Diverticula, thickening of the wall, increased density of the pericolic fat	• **Stage 1a:** Pericolic air bubbles or small amount of pericolic fluid without abscess (within 5 cm from inflammed bowel segment) • **Stage 1b:** Abscess ≤4 cm
	• **Stage 2a**: Abscess >4 cm • **Stage 2b:** Distant gas (>5 cm from inflammed bowel segment)
	Stage 3: Diffuse fluid without distant free gas
	Stage 4: Diffuse fluid with distant free gas

CT scan can also rule out other diagnoses such as ovarian pathology, or leaking aortic or iliac aneurysm. CT findings in patients with ALCD may include diverticulosis with associated colon wall thickening, fat stranding, phlegmon, extraluminal gas, abscess formation, or intra-abdominal free fluid CT criteria may also be used to determine the grade of severity and may drive treatment planning of patients [27]. US is a real-time dynamic examination with wide availability and easy accessibility [28]. Its limitations include operator dependency, poor assessment in obese patients, and difficulty in the detection of free gas and deeply located abscesses [29].

15.2.4 The Nonoperative Treatment

15.2.4.1 Stage 0: Uncomplicated Acute Diverticulitis

Uncomplicated acute diverticulitis is defined as localized diverticular inflammation without any abscess or perforation. In recent years, several studies demonstrated that antimicrobial treatment was not superior to withholding antibiotic therapy, in terms of clinical resolution, in patients with mild unperforated diverticulitis [30]. The current consensus is that uncomplicated acute diverticulitis may be a self-limiting condition in which local host defenses can manage the inflammation without antibiotics in immunocompetent patients. In this context, antibiotics are not necessary in the treatment of uncomplicated disease [24]. If antibiotic therapy is necessary, oral administration of antibiotics may be equally as effective as intravenous administration. An expeditious switch from intravenous to oral may allow a rapid patient discharge [31]. Patients with uncomplicated acute diverticulitis symptoms without significant comorbidities, who are able to take fluids orally and manage themselves at home, can be treated as outpatients. They should be re-evaluated within 7 days from the time of the diagnosis. However, if the clinical condition deteriorates, re-evaluation should be carried out earlier. Patients with significant comorbidities and unable to take fluids orally should be treated in hospital with intravenous fluids.

15.2.4.2 Stage 1 and 2: Locally Complicated Acute Diverticulitis

Approximately 15–20% of patients admitted with acute diverticulitis have an abscess on CT scan [32]. In presence of pericolic air bubbles, small amount of pericolic fluid without abscess (within 5 cm from inflammed bowel segment) (Stage 1a) and in presence of abscess (Stage 1b or 2a) the treatment required was always antibiotic therapy. If the abscess is limited in size (Stage 1b), systemic antibiotic therapy alone is considered safe and effective in removing the abscess and solving acute inflammation with a pooled failure rate of 20% and a mortality rate of 0.6% [33]. The size of 4–5 cm may be a reasonable limit between antibiotic treatment alone, versus percutaneous drainage combined with antibiotic treatment in the management of diverticular abscesses [34]. A high suspicion for surgical control of the septic source should be maintained and a surgical treatment should be performed if the patient shows a worsening of inflammatory signs or the abscess does not reduce with medical therapy.

15.2.4.3 Stage 2b: The Role of Nonoperative Treatment

Although most patients hospitalized for acute diverticulitis can be managed by nonoperative treatment, up to 25% may require urgent operative intervention [35]. Highly selected group of patients at this stage may be treated by conservative treatment. However, it may be associated with a significant failure rate (57–60%) and a careful clinical and CT monitoring is mandatory [36]. Moreover, nearly 60% patients with distant intraperitoneal gas were primarily treated by surgery.

15.2.5 Operative Treatment

15.2.5.1 Stage 3 and 4

The recent update WSES guidelines [24] recommend Hartmann's Procedure (HP) for managing diffuse peritonitis in critically ill patients and in selected patients with multiple comorbidities. Whereas in clinically stable patients with no comorbidities suggest primary resection with anastomosis with or without a diverting stoma. The same authors suggest to perform an emergency laparoscopic sigmoidectomy only if technical skills and equipment are available. In fact, laparoscopic sigmoidectomy for diverticulitis had initially been confined to the elective setting. A damage control surgical strategy may be useful for patients in physiological extremis from abdominal sepsis [37]. The initial surgery focuses on control of the sepsis, and a subsequent operation deals with the anatomical restoration of the gastrointestinal tract, after a period of physiological resuscitation. Laparoscopic lavage and drainage can potentially avoid a stoma in patients with diffuse peritonitis. It consists of the laparoscopic aspiration of pus followed by abdominal lavage and the placement of abdominal drains, which remain for many days after the procedure. However, it cannot be considered the first-line treatment in patients with diverticular peritonitis, as confirmed by the last WSES guidelines [24].

15.2.6 The Planning Elective Resection in Cases of Acute Diverticulitis Treated Nonoperatively

Currently, the decision to perform an elective resection after one or more episodes of AD should be undertaken on a case-by-case basis, considering risk factors, complications, age, and severity of episodes as well as the patient's personal circumstances and comorbidities (e.g., immunosuppressed patients). In particular the WSES suggest planning of an elective sigmoid resection after a single episode of ALCD treated conservatively in high-risk patients, such as immunocompromised patients [24].

15.2.7 Antibiotic Therapy

The most common organisms that cause diverticulitis are *E. coli*, *K. pneumoniae*, and *B. fragilis*; thus, empiric therapy should at a minimum cover these organisms. Empiric therapy should also be guided by the severity of illness of the patient and

the extent of disease. Antibiotic therapy plays an important role in the management of complicated acute diverticulitis. Typically, it is an empiric antibiotic treatment. The regimen should depend on the severity of infection, the pathogens presumed to be involved, and the risk factors indicative of major resistance patterns. Patients who have signs of sepsis beyond 5 to 7 days of adequate antibiotic treatment warrant aggressive diagnostic investigation in search of a reservoir of infection. For patients with complicated diverticulitis with an abscess, fistula, obstruction, or perforation, four therapy with cefazolin, cefuroxime, or ceftriaxone, all plus metronidazole or ampicillin/sulbactam alone or ertapenem can be used. For patients with complicated diverticulitis associated with sepsis, consider broader coverage for Enterobacteriaceae and Pseudomonas with piperacillin/tazobactam or cefepime plus metronidazole. For patients with severe penicillin allergies, consider fluoroquinolone or aztreonam-based regimens, making sure to include anaerobic coverage unless moxifloxacin is used. Moxifloxacin has anaerobic activity; thus, addition of metronidazole is not needed when using this agent. Vancomycin should be added to ciprofloxacin and aztreonam in patients presenting with sepsis as these agents do not have Gram-positive activity to cover streptococci or enterococci.

15.3 Sigmoid Volvulus

15.3.1 Introduction

The term "volvulus" identifies the torsion of a segment of the gastrointestinal tract (from Latin "volvēre," meaning "to roll or twist"). The incidence of SV varies worldwide. High incidence has been reported in regions such as Latin America, Africa, Eastern Europe, Scandinavia, Russia, Middle East, Pakistan, and India, where this condition has been defined as endemic [38]. In these regions, sigmoid volvulus accounts for 20 to 54% of intestinal obstructions as opposed to low-incidence areas such as North America, Western Europe, and Australia, where SV accounts for 3–5% of intestinal obstructions [39].

15.3.2 Diagnosis

Common investigations include abdominal X-ray, contrast enema, or a CT scan, while endoscopy serves as a diagnostic and therapeutic technique and will be discussed in detail later in this chapter. Diagnostic accuracy of abdominal X-ray ranges from 57 to 90% [40]. Classic radiological findings include a markedly distended ahaustral sigmoid loop, that appears as a "coffee bean" (also known as "bent inner tube sign") with its apex projected under the left hemidiaphragm, which has a high specificity, although it is not always present [41]. Other highly specific radiological signs are the convergence of three radiopaque lines to the left inferior quadrant (Frimann-Dahl sign), and the identification of the sigmoid colon above the transverse colon. CT scan, albeit seldom required for diagnosis, has a high accuracy in detecting SV [42], with a sensitivity of 100% and a specificity >90%, showing a

whirled sigmoid pedicle, and is currently the preferred diagnostic study modality due to its rapidity and availability. Moreover, it can detect intestinal pneumatosis that appears as air bubbles within the bowel wall as a sign of sigmoid ischemia [43]. Endoscopic findings include a mucosal twisting with obstruction at the rectosigmoid junction.

15.3.3 Management

15.3.3.1 Nonoperative Treatment

Recently, the American Society for Gastrointestinal Endoscopy (ASGE) produced practice guidelines on the role of endoscopy in the management of colonic volvulus [44].

Patients with signs of complicated SV (peritonitis or perforation), recurrent volvulus, or unsuccessful nonoperative management are not eligible for endoscopic decompression and should be immediately referred for surgical management [45].

For patients who are eligible for nonoperative management, endoscopic detention represents the procedure of choice for SV decompression [46].

Endoscopic reduction is successful in 40–90% of cases [47, 48]. After successful detorsion of SV, elective surgical treatment should be strongly considered during the index admission if the patient can tolerate it after adequate preparation, since recurrence rates as high as 86% have been reported [48] and emergency surgery is associated with a considerable mortality risk.

15.3.4 Operative Treatment

15.3.4.1 Urgent Setting

Two possible scenarios represent an absolute indication for urgent surgical management: endoscopic management failure or the impossibility to perform it; suspicion or evidence of colonic ischemia, perforation or clinical findings suggestive of peritonitis and septic shock [46].

Surgical resection of the involved colonic segment is generally recommended, since simple detorsion carries a high mortality and recurrence risk [46].

The decision to perform a Hartmann's procedure, or a primary colorectal anastomosis with or without proximal diversion, is currently controversial.

Currently available data does not support the use of one technique over the other, and the decision on which approach to adopt highly depends on the surgeon's judgement. Nonetheless, several factors should be taken into account when deciding to perform an anastomosis, including patient's hemodynamic status, septic status, comorbidities, medications, functional status, intraoperative findings, and tissues viability.

15.3.4.2 Elective Setting

If nonoperative management is successful and the patient's surgical risk is reasonable, current consensus is that surgical intervention should be performed within 2 days of SV reduction or within the index admission [46].

Among the number of procedures that have been proposed in this setting (including Hartmann's resection, resection and anastomosis, detorsion alone, detorsion and colopexy and percutaneous colostomy), resection of the redundant sigmoid colon with primary anastomosis seems to have the best results in terms of preventing recurrence [45, 46].

15.4 Acute Appendicitis

15.4.1 Introduction

In young people, acute appendicitis (AA) is one of the most common cause of surgical acute abdomen. Lifetime risk of AA is 8.6% for male and 6.9% for women [49]. The peak of incidence is between 10 and 20 years old. Every year about 50,000 of appendectomies are performed in the UK and 300,000 in the USA. In our country the annual incidence of AA is 0.2%. The mortality for AA is 0.3% for uncomplicated conditions, but this percentage rises up to 1.7% in the complicated forms. AA can hide the presence of malignancies and often the onset symptoms are in 50% of appendiceal neoplasms, in 40% of cecum colon cancers and in 15% of whole colon cancers AA represents the onset condition [50].

15.4.2 Classification

There are several classifications for AA, but the most recent is proposed by Gomes et al. [51] and it is based on intraoperative findings:

- *Non-complicated Acute Appendicitis:*
  - Grade 0: Normal Looking Appendix (Endoappendicitis – Periappendicitis)
  - Grade 1: Inflamed Appendix (Hyperemia, edema with or without fibrin, without or little pericolic fluid)
- *Complicated Acute Appendicitis:*
  - Grade 2: Necrosis A Segmental (without or little pericolic fluid)
    B Base Necrosis (without or little pericolic fluid)
  - Grade 3: Inflammatory tumor A Phlegmon
    B Abscess <5 cm
    C Abscess >5 cm without peritoneal free air
  - Grade 4: Perforated diffuse peritonitis with or without peritoneal free air

15.4.3 Diagnosis and Indication

Symptoms and Sign [52]*:*

- Right Iliac Fossa (RIF) pain 91.2% (looking for: *Rovsing's sign, Psoas' sign, Obturator sign*)
- RIF tenderness or RIF rebound tenderness 69.9%
- Diffuse rebound tenderness or muscular defense 11.7%
- Vomiting 42%
- Fever 24.7%
- White Blood Cell (WBC) count >10,000 GB 24.7%
- CRP >10 mg/l 46.1%

15.4.4 Diagnostic Scores (Tables 15.7 and 15.8)

15.4.5 Therapy

The "gold standard" for the treatment of AA is appendectomy. If experienced team and equipment are present, laparoscopic appendectomy (LA) should represent the first choice since it offers advantages in terms of less pain, reduced LOS, lower occurrence of surgical site infection (SSI), earlier return to work, and overall costs. LA shows clear benefit in the treatment of obese or elderly patients and those with comorbidities. Several data from literature found LA more beneficial and cost-effective than open surgery also for complicated AA [52]. Nonoperative management with antibiotic therapy can be successful in selected patients in order to avoid surgery. This approach must be proposed only to patients with low risk of complicated AA, often at first admission for RIF pain. The patients should receive initial intravenous antibiotics with subsequent conversion to oral treatment. The clinical monitoring should continue until the symptoms disappear. The risk of recurrence is up to 38%.

Table 15.7 Alvarado Score [53]

Alvarado score	
Feature	Score
Migration of pain	1
Anorexia	1
Nausea	1
Tenderness in right lower quadrant	2
Rebound pain	1
Elevated temperature	1
Leukocytosis	2
Shift of white blood cell count to the left	1
Total	10

<5 Sensibility, exclusion of AA 99% (IC 95%, 97–99%)

Table 15.8 Appendicitis Inflammatory Response (AIR) [54]

Variables	Score
Vomiting	1
Right iliac fossa pain	1
White blood cell count	
• 10.000–14.000 /dl	1
• ≥15.000/dl	2
CRP	
• 10–49 g/L	1
• ≥50 g/L	2
Polymorphonuclear leukocytes	
• 70–84%	1
• ≥85%	2
Pyrexal (>38.5 °C)	1
Rebound tenderness or guarding	
• Light	1
• Medium	2
• Strong	3

<4 Sensibility, exclusion of AA 96% >8 specificity, diagnosis of AA 99%

15.4.6 Tips and Tricks for Laparoscopic Appendectomy

15.4.6.1 Patients Position

Supine, general anesthesia.

First operator on the left side.

15.4.6.2 Trocars Position

- Hasson's trocar umbilical
- 5 mm Left iliac fossa
- 5 mm–10 mm suprapubic

15.4.6.3 Diagnostic Laparoscopy

- Abdominal fluid (ascites, purulent, fecaloid)
- Gallbladder disease
- Gynecological disease
- Meckel diverticulum
- Other?

15.4.6.4 Mesoappendix Dissection

Monopolar electrocoagulation and bipolar energy are the most cost-effective techniques.

High energy devices can be used without clear advantages.

15.4.6.5 Stapler vs Endoloop for Stump Closure

The choice should be individualized on the basis of cecum and appendicular stump condition. If it were possible to use both, endoloops might be preferred for lowering the costs but operative time maybe longer.

15.4.6.6 Vesical Catheter

It should be placed after general anesthesia and remove before the awakening. Its role is to protect the bladder during the insertion of suprapubic trocar.

15.4.6.7 Drainage

The choice should be individualized based on intraoperative findings.

15.4.6.8 SILA (Single Incision Laparoscopic Appendectomy)

Only for cosmetic intent in center with adequate experience.

Inclusion criteria for SILA:

- Normal weight female
- Uncomplicated appendicitis
- Without risk factor for incisional hernia (diabetes, smoke, umbilical hernia, midline diastasis)

15.5 Acute Presentation of Abdominal Wall Disease

15.5.1 Epidemiology and Clinical Presentation

The wall abdominal diseases are traditionally divided into three categories:

- Primitive: arising from a weakness of abdominal wall
- Recurrent: occurring after surgery for a primitive hernia
- Incisional hernia: occurring along the course of a surgical scar

Lifetime risk of groin hernia occurrence is 27–43% for male and 3–6% for female [55]. The reasons that lead a patient to emergency ward are:

- Swelling and pain localized in the hernia area
- Irreducibility
- Irreducibility with pain (suspicion of incarceration)
- Occlusion

15.5.2 Diagnosis

15.5.2.1 Blood Exam

- Complete blood count: leukocytosis
- Lactate and CRP: high level

- Hepatic function
- Kidney function
- Coagulation

15.5.2.2 Radiological Exams

- US in the hernia area and abdominal
- Abdominal and chest RX
- Enhanced CT scan with contrast

If surgeon is involved in urgent consultation for abdominal wall disease, there will be three ways he can take:

- Complete resolution of the problem and refer the patient to elective surgery. The reduction maneuverers are successful. The pain is restored and the laboratory test or radiological finding is normal.
- Resolution of the problem and refer the patient to deferred urgency. The reduction maneuverers are successful but the pain is still present. Probably the patients have had other similar episodes in their life. The laboratory test or radiological finding is not normal and may show inflammation pattern or abdominal effusion.
- Failure of conservative approach and emergency surgery. The reduction maneuverers are not successful. This approach must be chosen in the presence of a high suspect of bowl ischemia or confirmed by CT scan.

15.5.3 Surgery for Hernias

The steps during emergency surgery for hernia are:

- Isolation of the hernia content
- Check of the viability of the hernia content with possible resection (bowel or omentum)
- Reduction of the hernia content
- Defect closure (with or without mesh repair)

15.5.4 Surgery for Urgent Groin Hernia

In surgical ward, the first attempt worth making is manual reduction.

This procedure could cause excruciating pain then the aid of a mild sedation can increase the success rate. In the absence of intestinal ischemic suffering, the treatment of choice is anterior approach with mesh repair. The viability of the content can be evaluated intraoperatively through a small incision in the peritoneal sac. This maneuver allows the collection of peritoneal fluid or the resection of a necrotic tract of omentum. If the effusion is purulent or fecal and if there is high suspect of bowel involvement, the abdominal cavity must be controlled by laparoscopy or laparotomy. The main contraindications to diagnostic laparoscopy are related to the

patient's hemodynamic status, the bowel distension, and the low laparoscopic experience of the surgical team. In case of clear fecal contamination, the mesh repair must be avoided.

15.5.5 Incisional and Other Midline Hernias

The urgent treatment of midline hernias including umbilical ones rely on the same advices of groin hernias. The isolation of hernia content evaluating the viability, its liberation from the crawler followed by the reduction in abdominal cavity and the defect repair are the main phases of the surgery. The incision can be used for the diagnostic laparotomy with the possibility of intestinal resection or other required procedure.

Incisional hernia can be challenge due to the scar of previous surgery. The fascial weakness almost always requires prosthetic repair. Incisional hernia often has a visceral involvement and, in urgent setting, the risk of visceral damage is high. Moreover, at the end of the reduction of the content it is impossible to proceed with a direct closure of the defect. In these cases, it is indicated the use of a biologic mesh to restore the abdominal wall.

15.6 Anorectal Emergencies

15.6.1 Introduction

The term "anorectal emergencies" refers to anorectal disorders presenting with some alarming symptoms such as acute anal pain and bleeding that might require an immediate management. They are represented by: thrombosed external hemorrhoids, thrombosed or strangulated internal hemorrhoids, anorectal abscess, rectal prolapse, anal fissure, rectal bleeding. Diagnosis of any of anorectal emergencies must include a physical examination that should include inspection of perianal tissues, anorectal digital examination, and anoscopy when available based on the patient's symptoms and pain [56].

15.6.2 Acute Thrombosed External Hemorrhoids

Classic symptoms of presentation are acute anal pain with a newly enlarged or tender blush lump at the anal verge. Some patients can describe a recent history of constipation or prolonged straining.

The management of this acute condition can be conservative or surgical depending on patient's symptoms.

The conservative treatment includes anti-inflammatory analgesics, phlebotonics, warm size bath and drugs avoiding constipation. The excision of thrombosed external hemorrhoid with surgical removal of the clot is reserved in patients with severe pain within 48–72 h from the onset of symptoms [57].

15.6.3 Thrombosed Internal Hemorrhoids

Internal hemorrhoid may become strangulated and thrombosed when prolapsed part is left protruded until vascular compromise. The management consists in manual reduction of the masses to relieve patient's pain then an urgent hemorrhoidectomy [58].

15.6.4 Rectal Bleeding

Rectal bleeding is a symptom that can represent different types of pathology of gastrointestinal tract like hemorrhoids, anal fissure, IBD, and rectal neoplasm. The patient history and the physical examination are necessary to differentiate the possible reason of the bleeding. The blood may be spotted on the toilet paper or could be on the toilette. Usually it is characterized by a painless passage of bright-red blood during bowel movements. In patients with rectal bleeding, an anoscopy and colonoscopy are mandatory to rule out the pathology that cause the bleeding [59].

15.6.5 Anal Fissure

Painful defecation with or without passage of red blood is a typical symptom of this condition. The patient can describe that the pain may last from minutes to hours after defecation. Patients are basically pain-free between bowel movement. During the anoscopy is visible a small linear laceration of the anoderm (acute anal fissure). For those who experience a long history of painful defecation a chronic linear laceration of the anoderm is visible, with hypertrophic anal papilla and enlarged perianal skin tag (chronic anal fissure). For acute anal fissure a conservative management is the treatment of choice that includes adequate pain control, stool softeners, topical nitrate and topical calcium channel blocker. For patient with chronic anal fissure, a botulin injection or a lateral anal sphincterotomy remains the treatment of choice [60].

15.6.6 Anorectal Abscess

The anorectal abscess is one of the most frequent anorectal emergencies in the ED. They usually originate from an infected anal gland located in the anal mucosa. The abscess can reach the inter-sphincteric area, supra-elevator space, perianal region, deep post-anal space, and ischiorectal fossa. Most of the abscess can be diagnosed with a careful history and physical examination that must include anorectal digital examination. Patient usually refer anal pain, fever, and the presence of a tender mass. The fluctuation of the abscess can't be evident. An endoanal ultrasonography, a CT scan, or MRI of the pelvis may add some additional information on the extension and exact location of the abscess and help to make the correct decision

on the management. The gold standard treatment is an adequate drainage of the abscess that can be done in ED with some sedation or in operating room, depending on the exact location of the abscess and surgeon's experience. An expert surgeon on colorectal disease may provide a definitive treatment of anal fistula but this type of approach is still in debate [61].

15.6.7 Rectal Prolapse

Classical signs of rectal prolapse are protruding full-thickness rectal wall with concentric rings of mucosa. It is important to differentiate between rectal prolapse or prolapsed internal hemorrhoid because of the different types of management needed.

Clinical and physical examination of anal region are mandatory. An irreducible rectal prolapse is quite rare but can happen.

For strangulated irreducible rectal prolapse an emergent surgery with rectosigmoidectomy is the treatment of choice. For all those rectal prolapse that can de reduce a conservative treatment and elective surgery can be scheduled [62].

15.6.8 Bowel Obstruction

15.6.8.1 Introduction

A complete history, laboratory tests, and physical examination must be done for all patients attending to the emergency department with abdominal pain. It is very important to know about when the abdominal pain has begun, the type of pain and when was the last pass of gas/defecation. A history of previous abdominal surgery or episode of obstruction or presence of diverticula or rectal bleeding are important news to know in order to think about the possibility of a bowel obstruction. The main cause of bowel obstruction can be differentiated between small bowel obstruction and large bowel obstruction. For small bowel obstruction the main causes are adhesions and hernias, the remaining are malignancies, carcinomatosis, endometriosis, IBD, foreign bodies, and bezoars. For large bowel obstruction, the main causes are malignancies, diverticular stenosis, and volvulus (Fig. 15.1).

15.6.9 Diagnosis

The initial radiological examination on the guide of the clinical presentation is represented by standard abdominal X-ray and ultrasound. On the basis of this exam, a CT scan can be performed to better understand the level of the obstruction. Supportive treatment with hydration, anti-emetics, and bowel rest must be done. A nasogastric suction is useful for initial diagnosis and treatment. A CV must be insert. Low arterial blood pH and high lactic acid level may be useful in the diagnosis of intestinal ischemia. In case of small bowel obstruction for adhesions, a water-soluble contrast administration can be performed. It is a feasible NOM with low

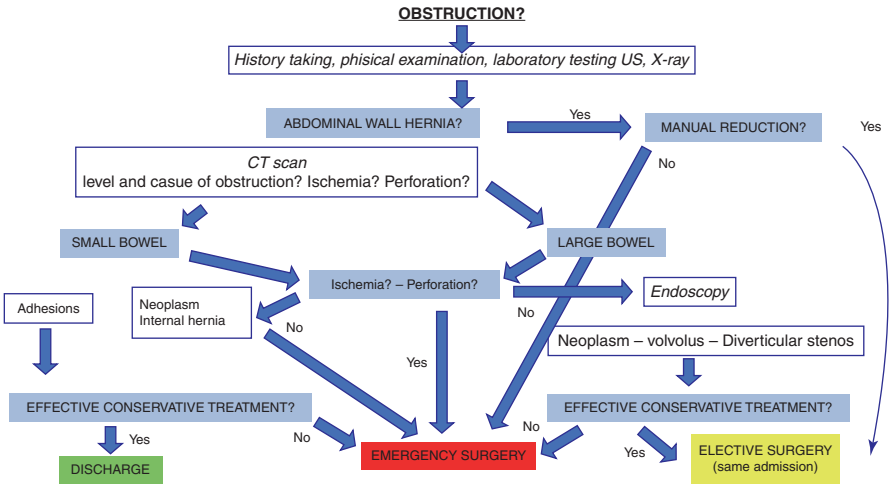

Fig. 15.1 Management strategy of bowel obstruction (for about 90% of causes)

morbidity and mortality. Colonoscopy is limited to the large bowel obstruction. To minimize the burden of ionizing radiation in children and pregnant women, magnetic resonance imaging is a valid alternative examination to computed tomography scan for bowel obstruction [63].

15.6.10 Therapy

15.6.10.1 Conservative Treatment

NOM is safe and useful for all small bowel obstruction caused by adhesions. Water soluble administration is useful. Evidence are lacking but for many authors 72 h of duration is safe and appropriate. In case of hernia a manual reduction has to be attempted. In case of unsuccessful reduction emergency surgery is needed. Diverticular obstruction can be solved with NOM. Sigmoid volvulus may benefit of endoscopic detorsion. In case of colonic necrosis, immediate surgery is needed. In case of left colon cancer obstruction, a self-expanding stent as bridge to surgery in centers with adequate expertise must be preferred to a diverting stoma [64].

15.6.10.2 Surgery

For abdominal wall complicated hernia, surgery is the treatment of choice. A prosthetic repair is mandatory. Diagnostic laparoscopy is useful to assess the bowel viability after reduction. Adhesiolysis for small bowel obstruction can be performed laparoscopically or by open surgery. In case of small bowel tumors, resection and anastomosis following oncological principles must be done. For large bowel obstruction, caused by a sigmoid volvulus, surgery is necessary in case of multiple episodes or ischemia and perforation. For large bowel tumors, surgery is needed when a "bridge to surgery" is not possible [60, 61].

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