

ABDOMINAL PAIN - ENTEROCOLITIS AND GENITO-URINARY ETIOLOGIES

ENTEROCOLITIS

Diarrhea is the characteristic feature of enterocolitis, and can be related to several causes. Infectious (bacterial or viral), radiation-induced, and chemotherapy-associated enterocolitis are all possible. The cause, and, therefore, the treatment, is largely based upon obtaining a detailed patient history. Onset and duration of diarrhea, vomiting, fever or abdominal pain, as well as prior exposure to particular food sources, water, animals, and travel abroad are all keys to narrowing the differential diagnosis. Physical examination may reveal abdominal tenderness and distension, borborygmus (a rumbling or gurgling noise made by the movement of fluid and gas in the intestines), and signs of dehydration. In patients with profuse diarrhea, perianal skin breakdown may occur.

In patients with severe or prolonged symptoms, work-up is required. This typically begins with basic laboratory tests to determine if electrolyte abnormalities exist. Additionally, stool studies are frequently performed. *Clostridium difficile* infection is common in geriatric and institutionalized patients, and specific testing should be considered for select patients. Stool cultures may provide diagnostic benefit in order to determine infectious causes, and aid in treatment decisions.

Plain abdominal radiographs are less useful than computed tomography (CT) scanning. Many patients will have abdominal distension and bowel dilation, and, therefore, plain film evaluation has limited diagnostic capability. CT images may show specific segments of inflammation, along with more detailed information regarding potential need for surgery, such as pneumatosis or small amounts of free intraperitoneal air.

Approximately 10% of patients with enterocolitis will present with symptoms requiring medical evaluation. As such, most patients will require no specific treatment other than oral hydration. Although clinical benefit is dependent upon the inciting bacteria, bacterial causes are treated with antimicrobials and supportive care. While viral causes, such as norovirus and rotavirus are addressed with supportive care and hydration only. Infectious causes of enterocolitis should not generally be treated with anti-diarrheal medications.

Clostridium difficile infections vary in severity from mild to severe. Mild cases are treated as outpatients with oral antibiotics (metronidazole). Moderate infections are frequently treated as inpatients, with parenteral antibiotics and oral vancomycin. Refractory or severe cases with signs of organ failure or sepsis may require total abdominal colectomy. These patients are often admitted to the intensive care unit, and can benefit from early, aggressive surgical intervention.

Radiation-induced enterocolitis is difficult to treat, and therapies are often initiated to provide symptom control. Antidiarrheals, nutritional support with a low-residue diet, glucocorticoids and short-chain fatty acid enemas may provide some improvement, but symptoms often recur with

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discontinuation of therapy. Strictures and obstruction may result from chronic inflammation and require surgical resection or bypass if non-surgical methods fail.

Patients who are undergoing chemotherapy and present with diarrhea and severe inflammation of the cecum are diagnosed with neutropenic colitis, or *typhlitis*. Neutropenic colitis is a serious entity and frequently requires admission to an intensive care unit and surgical consultation. Unlike other causes of enterocolitis, neutropenic enterocolitis can be treated with immune therapy, specifically, granulocyte colony-stimulating factor in addition to antibiotics and supportive care. Perforation, hemorrhage, sepsis, or failure to improve are all indications for surgical intervention, and may include colectomy, cecostomy or defunctionalization of the colon with a loop ileostomy.

Antibiotic-associated diarrhea results from bacterial overgrowth after susceptible organisms have been eradicated by the offending antibiotic. The first step in management is to discontinue the current antibiotic. If the patient still requires antimicrobial therapy, a different class of antibiotics should be utilized. Antibiotic-associated enterocolitis is typically self-limited and requires only supportive care.

GENITOURINARY ETIOLOGIES OF ABDOMINAL PAIN

Genitourinary causes of abdominal pain vary widely, especially in female patients where ovarian, uterine, and fallopian tube abnormalities can result in less frequent diagnoses. Eliciting a detailed history and accurate physical exam are crucial steps to obtaining the correct diagnosis. Abdominal pain associated with genitourinary issues are frequently high-acuity, time-sensitive diagnoses that require emergent surgical intervention, and, thus, a high index of suspicion should drive rapid evaluation and management when patients exhibit signs of a genitourinary issue.

Ureterolithiasis

Approximately 12% of adults will experience symptoms related to urinary calculi. Occurring more than twice as often in males, ureteral colic can be associated with severe, unrelenting flank pain. Patients will often describe a sudden onset, dull flank or lower-quadrant abdominal pain that radiates to the groin or pelvis. As it progresses in severity, nausea and vomiting develop. If associated with a urinary tract infection, fever may also be present. Urgency and frequency are frequently associated with ureterolithiasis as well. Physical exam findings are often minimal. Pain is rarely worsened with palpation of the abdomen. Often, the only physical exam finding is the presence of costovertebral tenderness, and may indicate coincident pyelonephritis or urinary tract infection.

Urinalysis will reveal microscopic hematuria approximately 90% of the time, while pyuria is present in 10% of patients. As more than 90% of ureteral stones are radiopaque, plain film evaluation of the abdomen (KUB) has some utility, but the preferred investigation of choice is a non-contrasted computed tomography (CT) scan of the abdomen and pelvis.

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Most stones will pass spontaneously with adequate hydration and pain control. Non-steroidal anti-inflammatories (ketorolac) are typically the pain management of choice, but in patients with severe symptoms, narcotics and muscle relaxants are frequently utilized. Aggressive control of nausea and vomiting is important, both for patient comfort as well as to prevent electrolyte abnormalities.

Surgical treatment for ureterolithiasis is rarely necessary. Only for recurrent or large renal calculi are extracorporeal shock wave lithotripsy or minimally-invasive techniques utilized. Open operations are rarely performed, and are reserved for patients with recurrent pyelonephritis and severe hydronephrosis after less-invasive treatments have failed. Lithotripsy involves directing shock waves toward the calculus. Complications from lithotripsy are rare, with the most frequent being ureteral obstruction from stone fragments. Percutaneous nephrolithotomy (PCNL) is performed for large renal stones or upper ureteral stones, and involves a small flank incision through which a rigid scope is advanced and stones are fragmented and removed. Persistent lower ureteral calculi are treated with ureteroscopy, stone removal, and often, stent placement.

Pyelonephritis

Classically characterized by dysuria, fever, and costovertebral flank pain, pyelonephritis can develop a variety of sequelae. Nausea and vomiting are frequently experienced, and symptoms may be minimal or severe. Young patients frequently have mild symptoms, but commonly in the geriatric population, pyelonephritis may lead to systemic compromise resulting in sepsis. Physical examination findings are often minimal, and may include costovertebral tenderness.

The hallmark in diagnosis is the presence of pyuria with urinalysis. Nitrites are highly sensitive and specific for urinary tract infection, although may be falsely negative with diuretic use or infection by atypical bacteria. Urine and blood cultures should also be performed, as up to 20% of patients will have bacteremia.

Treatment involves fluid resuscitation and antimicrobial therapy. The amount and route of administration is dependent upon severity. For example, outpatient management is frequently accomplished with oral antibiotics (trimethoprim-sulfamethoxazole, ciprofloxacin are most common). Geriatric patients, pregnant women, and those with systemic compromise should undergo inpatient therapy with intravenous antimicrobials and fluid resuscitation. Rarely, surgery is required for severely ill patients with emphysematous pyelonephritis or abscess formation. Surgical intervention is reserved for severely ill patients, and may require nephrectomy.

Testicular Torsion

Primarily occurring in patients under the age of 30, testicular torsion represents a surgical emergency. Testicular torsion results in sudden, severe unilateral scrotal pain. Abdominal and lower pelvic pain are often present, as well as nausea and vomiting, which can occur in up to 30% of patients. Patients may report recent trauma or physical activity shortly before symptoms

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began. Physical examination findings include severe testicular tenderness and swelling, absence of the cremasteric reflex, and abnormal testicular direction. The Testicular Workup for Ischemia and Suspected Torsion (TWIST) scoring system is a validated method to assist in diagnosis and includes: Testicular swelling, Hard testis, Absent cremasteric reflex, Nausea/vomiting, and High-riding testis.

While testicular torsion is a clinical diagnosis, ultrasound evaluation may be utilized when the diagnosis is unclear. Color Doppler examination will show absent or decreased blood flow when torsion exists.

Treatment is surgical and mandates emergent intervention within 6 hours of developing symptoms. Delays are associated with infertility. Open detorsion and bilateral orchiopexy is the standard procedure, however, nonviable testis may require orchiectomy. Fixing the testes bilaterally to the scrotal wall is performed, as patients are at risk to develop torsion on the contralateral testis.

Ovarian Torsion

Ovarian torsion is associated with pregnancy in approximately 20% of cases, while ovarian tumors are found in approximately 50% of women with torsion. Sudden onset of low, sharp, stabbing abdominal pain with associated nausea and vomiting are common symptoms. The pain is often unilateral and may radiate to the back, flank, or groin. Fever is a late sign, and is indicative of ovarian necrosis. Symptoms are nonspecific and similar to many other entities, such as ectopic pregnancy, tubo-ovarian abscess and appendicitis. The classic physical examination finding of a tender adnexal mass is present in approximately half of patients with torsion, and, thus, further workup is required.

When ovarian torsion is suspected, early ultrasound evaluation should be undertaken. Color Doppler imaging is helpful to determine adequate blood flow to the ovary. In the case of normal Doppler findings, the diagnosis of ovarian torsion may still exist. In these cases, magnetic resonance imaging or CT may be beneficial in select patients.

Laparoscopy is utilized extensively in treatment of torsion, with the goal to preserve ovarian function, with simple detorsion. Ovarian cystectomy may be performed, but is often technically difficult, and, therefore, may occur in a staged fashion. Salpingo-oophorectomy is avoided, except in the case of suspected malignancy or necrosis of the torsed ovary. Surgical detorsion is the only treatment, and pregnancy does not preclude it. Recurrence after detorsion is approximately 25%.

Ruptured Ovarian Cyst

Ruptured follicles occur with every cycle in menstruating women, and, thus, is a very common entity. Mild pain is frequent and often transient (*mittelschmerz*). When large cysts rupture, however, the pain can be severe. Women present with severe, acute onset abdominal pain. Physical activity often precedes the pain, and it often occurs mid-cycle. In addition to pain, vaginal bleeding, nausea, and shoulder pain may occur. Sequelae of large cyst ruptures

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associated with hemorrhage, may rarely present with hypotension and signs of hemorrhagic shock. Physical exam findings vary, but, in general, the pain and tenderness are localized to one side. Peritonitis is rare, and may be associated with signs of hypovolemia. Many cases may resemble appendicitis or ectopic pregnancy. And as such, a pregnancy test should be performed.

Ultrasound is the preferred imaging technique in most suspected gynecologic issues, including ruptured ovarian cysts. CT is especially useful when ultrasound results are equivocal, and can help identify other entities on the list of possible diagnoses.

Most patients are managed conservatively with oral pain control. Severe cases may require surgery, which is most often performed laparoscopically. In cases where there is evidence of ongoing or profound hemorrhage, suture ligation of bleeding vessels or cauterization is performed. Only in rare cases is a salpingo-oophorectomy necessary. Long-term prophylaxis may be instituted for recurrent cases via oral contraception medications.

Pelvic Inflammatory Disease and Tubo-Ovarian Abscess

Young women, with multiple sex partners who do not use contraception are at high risk to acquire sexually-transmitted infections that may progress into both acute and chronic inflammatory conditions. Inflammation secondary to salpingitis can result in adherence of the ovary and fallopian tube. Ongoing infection and inflammation can result in abscess formation between the two structures. Symptoms are similar to other gynecologic entities, and include fever, acute unilateral abdominal pain, and nausea. Pain typically begins a few days after the last menstrual period and is characterized as dull or aching. Abnormal vaginal discharge is a key to diagnosis, and is present in approximately 75% of cases.

Transvaginal ultrasound or CT imaging can be helpful in diagnosing tubo-ovarian abscesses. Poor patient tolerance to transvaginal ultrasound may be exhibited, as adnexal tenderness is frequently encountered. In some cases, laparoscopy can be utilized if the diagnosis is elusive.

Broad-spectrum parenteral antibiotics (cefotetan or cefoxitin, plus doxycycline) are the first-line treatment of small, unruptured tubo-ovarian abscesses. If patients fail to improve, drainage is mandated. Percutaneous drainage and laparoscopic techniques are routinely employed, while salpingo-oophorectomy is rarely indicated if ovarian parenchyma is not involved.

Ectopic Pregnancy

In a young female with acute onset abdominal pain, amenorrhea, and vaginal bleeding, ectopic pregnancy must be considered. Patients will often have nausea and cramping that is similar, but worse to menstrual cramps. Patients may present in a delayed fashion, as the symptoms are similar to those previously experienced. Physical examination is likely to exhibit lower abdominal tenderness, and vaginal examination may show cervical motion tenderness. In cases of ectopic rupture, signs and symptoms of hemorrhagic shock may be present and warrant emergent intervention.

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Transvaginal ultrasound is the imaging modality of choice where a mass will be visualized within the salpinx, and may reveal inflammatory changes and free intraabdominal fluid. Blood serum hCG is an important early laboratory test, and is expected to be elevated.

In asymptomatic patients with an ectopic pregnancy, methotrexate may be administered. Symptomatic patients and those with larger ectopic pregnancies are more likely to require surgical intervention. Multiple studies have shown benefits to laparoscopic salpingectomy, and, thus, this procedure is widely performed. In the case of a patient with an abnormal or absent contralateral fallopian tube, laparoscopic salpingostomy may be considered, but has a higher complication and recurrence rate.

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