



The differential diagnosis of acute pelvic pain in various stages of the life cycle of women and adolescents: gynecological challenges for the family physician in an outpatient setting

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Acute pain is of sudden onset, intense, sharp or severe cramping. It may be described as local or diffuse, and if corrected takes a short course. It is often associated with nausea, emesis, diaphoresis, and anxiety. It may vary in intensity of expression by a woman's cultural worldview of communicating as well as her history of physical, mental, and psychosocial painful experiences. The primary care physician must dissect in an orderly, precise, and rapid manner the true history from the patient experiencing pain, and proceed to diagnose and treat the acute symptoms of a possible life-threatening problem.

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Introduction

Women at various ages and stages of their life cycle may present with different causes of acute pelvic pain. Establishing an accurate diagnosis from the multiple pathologies in the differential diagnosis of their specific pelvic pain may well be a challenge for the primary care physician. Acute pelvic as well as nonpelvic etiologies must be logically eliminated to arrive at a clinical working diagnosis. This article will enumerate and discuss the many causes of acute pelvic pain in adolescents aged 15 through 19, young women aged 20 through 40, and perimenopausal and postmenopausal females. Each age group has unique pathologies of acute pelvic pain but these may merge, causing a diagnostic dilemma. An adolescent's or a young adult's straightforward diagnosis of pelvic inflammatory disease with the primary care physician's understanding of age, development, and lifestyle risks in these age groups, may be low on the differential diagnosis in the perimenopausal sexually active female with a monogamous partner. Equally, a perimenopausal, menopausal, or postmenopausal

female's presentation of acute pelvic pain with an enlarged bulky uterus may often be diagnosed as a leiomyoma instead of a neoplastic mass. A pregnant female, whose pregnancy is either known to her or unknown, presenting with acute pelvic pain must be rapidly evaluated and treated to prevent a rapid downward cascading progression to maternal or fetal morbidity and mortality. This article will enumerate and discuss the gynecological and obstetrical causes of acute pelvic pain. It will include the nongynecological differential diagnoses of acute pain for each age group to be included in this diagnostic challenge. Topics for the presentation of acute nonpregnant pelvic pain will include pelvic inflammatory disease, endometritis, ruptured ovarian cyst, ovarian torsion, acute dysmenorrhea, endometriosis, and infarcted leiomyoma.

The differential diagnosis of acute pelvic pain in pregnancy will include ectopic pregnancy, abruptio placenta, spontaneous abortion, and septic abortion. The nongynecological causes of acute pelvic pain include gastrointestinal, urologic, musculoskeletal, vascular, neurologic and traumatic. The physician must have a crisp recall of the anatomy and physiology of the pelvis and its interconnection with interconnecting nervous system when diagnosing acute pelvic pain. The pelvis and lower gastrointestinal tract organs share sympathetic and parasympathetic innervations. This

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interconnection between innervations to the various organs may cause diagnostic confusion. Differentiating between an acute gynecological or an acute nongynecological event will become clearer as the history and physical examination proceeds.

Acute pain is defined as sudden in onset, intense, sharp, or accompanied with severe cramping. It may be described as local or diffuse and, when diagnosed and treated correctly, takes a short course. Acute pain is often associated with nausea, emesis, diaphoresis, and anxiety. It may also vary in intensity of expression by a woman's cultural world view of communicating as well as her past history of physical, mental, and psychosocial painful experiences. The International Association for the Study of Pain Task Force on Taxonomy defined pain as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage." The primary care physician must dissect in an orderly, precise, and rapid manner the differential diagnosis of women with acute pelvic pain, and proceed to diagnose and treat a possibly life-threatening pathology.

The challenges of sorting out a correct diagnosis when a woman presents to your office with a complaint of pelvic pain can be quite diffuse. The differential diagnosis of what is described as pelvic pain throughout a woman's life is multitude both in breadth and depth. A thorough pain history is mandatory in isolating the pain; points to consider are the location, radiation, time element, onset, duration, and the descriptive character of pain. Questions such as "Is it sharp?" and "What makes it worse, better?" have been used on various rating scales to quantify pain.¹⁻³ Certain pathologies revolve around age; lifestyle; and past gynecological, medical, surgical, and obstetric history. The history of present illness and a review of symptoms and systems, combined with a focused physical examination, alerts the family physician to an acute event. Delay or missing a diagnosis may lead to major complications. A systematic overview of patterns of the patient's posture, body habitus, language, and speech are helpful to quickly identify life-threatening interventions. It is your observational and interviewing skills that will assist the patient to communicate her concerns. As you question and listen to her verbal responses and identify nonverbal responses, an initial early differential diagnosis should be evolving.

A focused physical should include pelvic and abdominal examinations, and it may include cardiopulmonary, musculoskeletal, and neurologic examinations as well. A bimanual and speculum examination is a necessity and might include sexually transmitted infection (STI) testing or pregnancy confirmation if age and history are appropriate. Vital signs should be obtained immediately because the depth of hypotension or the height of fever assist in rapid triage. The knowledge gained in osteopathic palpatory diagnosis enhances an accurate rapid diagnosis.⁴

A woman at different stages of her life will present unique pathologies of pelvic pain. The differential diagnosis of acute pelvic pain encompasses not only gynecological

pathology but may include other body systems and organs to include urologic, gastrointestinal, musculoskeletal, vascular, neurologic, or metabolic diseases.

The pelvic organs share sympathetic and parasympathetic innervations with the lower gastrointestinal tract via T10 thru the lumbosacral plexus of shared nerves.⁵

Irritating stimuli such as infectious and inflammatory processes, benign or malignant tumors, expansive pressure, and distension in deep pelvic viscera may set up action potentials in terminals of afferent pain fibers. One must not forget as an osteopathic physician the importance of the viscerosomatic reflex in the evaluation of acute pelvic pain.⁴ Pain reaction also varies with culture, education, previous trauma or abuse, previous painful exposure, and environmental influences of a woman in pain presenting to your outpatient setting.

The adolescent

The adolescent presentation of acute pelvic pain may be a challenge to the practitioner. An understanding of the etiology of acute pain in an adolescent as well as basic understanding of adolescent physical, mental, and social development is crucial in obtaining an accurate history, with diagnosis and treatment to follow.⁶ One-to-one communication should be offered to respect the adolescent's sense of privacy and her psychosocial developmental needs.⁷ Acute pelvic pain in the 15 to 19 age group may have a broad spectrum of pathologies including gynecological, gastrointestinal, urologic, musculoskeletal, trauma, and psychosocial.^{6,8} The infectious cause of acute pelvic pain in the adolescent revolves primarily around STIs, with emphasis on pelvic inflammatory disease (PID). The most frequent organisms cultured in PID are chlamydia and gonorrhea. The rate of STIs, especially PID, are highest among the 15 to 19 age group. The rate of acquiring PID varied with first age of intercourse and by the number of male partners in the preceding 12 months. Higher prevalence was among those of a younger age and greater numbers of partners according to the Centers for Disease Control and Prevention's Quick Stats Report of 2006. Adolescents are more susceptible to acquire PID because of the frequency of unprotected intercourse, their biological susceptibility to infection, and their delay in using the health care system.⁹ When a septic female adolescent presents with a history of a nonprofessional, nonsterile abortion, one of the differentials should be a postabortion endomyometritis. An incomplete abortion or a life-threatening ruptured ectopic pregnancy may present with acute pelvic pain. Pregnancy testing should be part of the protocol in the adolescent evaluation of acute pelvic pain. Noninfectious presentations include rupture of a follicular or a corpus luteal cyst. Torsion of an ovary from an enlarged cyst or a dermoid may occur in an adolescent, similar to infants, young girls, and women. Endometriosis, as well as acute dysmenorrhea, may be dismissed in this age

group. Adenomyosis, the endometrial growth into the myometrium, is a rare cause of acute dysmenorrhea in this age group but does occur as do leiomyomas in youth. An imperforate hymen may cause acute pelvic pain when the buildup of menstrual blood and its obstruction to flow may appear as severe pelvic pain. Appendicitis, gastroenteritis, Crohn's disease, and colitis should be included in gastrointestinal causes of an adolescent presenting with acute pelvic pain. Urologic causes should include acute pyelonephritis and acute cystitis. The musculoskeletal pain of an acute osteopathic pelvic somatic dysfunction with asymmetry, restriction, and tissue texture changes must be in the adolescent differential.⁴

The young adult female

Acute pelvic pain in the young adult female (between 20 and 40 years of age) includes infectious and noninfectious pathologies. High on the list are STIs. Approximately 1.9 million new infections occur chiefly in this age group.¹⁰ Of the millions diagnosed with STIs, one of its consequences (PID) in this age group accounts as the highest incidence. If not diagnosed and treated accurately, an ascending endometritis as well as a tubo-ovarian abscess will complicate the pelvic pathology and lead to infertility.⁸ The etiology of an endometritis may well be an intrauterine device (IUD), douching, or procedures such as a hysterosalpingogram to diagnose tubal patency or a sonohysterogram when a gynecologic ultrasound is unclear in the evaluation of uterine pathology. If pregnancy occurs in the 20- to 40-year age group, a ruptured ectopic pregnancy must be in the differential diagnosis. The adnexal torsion of a right-sided, ruptured, ovarian, nonmalignant cyst in this group is highly possible because this reproductive age group has the highest incidence of ovarian torsions.^{11,12} Ovarian hyperstimulation accounted for 8% and pregnancy had a confirmed torsion rate of 17% to 18%.¹³ An astute physician will recall the difference in symptoms between an acute gastrointestinal appendicitis presentation from an acute gynecological pathology. Women of this age group have also been misdiagnosed with acute dysmenorrhea when the etiology of the pelvic pain is an adhered endometriosis implant. Acute pain may present as an enlarged degenerative fibroid uterus. Acute cystitis or pyelonephritis with their structures adjacent to pelvic organs should be entertained with symptoms of flank pain, fever, and dysuria. Young women in this age group may present with the acute gastrointestinal pain of Crohn's disease when pelvic pathology is eliminated.

Perimenopausal women

Perimenopause is a span of years before menopause when hormone levels are waning and menstrual cycles become anovulatory and/or erratic. Either irregular menses or a very

heavy anovulatory bleeding may occur at this time of a women's evolving life. Erratic bleeding may also be a sign of a gynecological pathology. Acute pelvic pain in perimenopausal women may include endometriosis with its concurrent painful adhesions to ligamentous or organ structures. The extremely acute painful presentation of an ovarian torsion twisting on its pedicle resulting from an enlarged ovarian cyst, a dermoid, or a cystadenoma is emergent. This must be differentiated from torsion of a malignant mass, more common in the postmenopausal age group. An infarcted leiomyoma may cause an acute pelvic pain associated with ischemia. Intramural, submucosal, subserosal, or cervical fibroids may cause pain from bulk pressure to pelvic nervous plexus. Torsion or degeneration of a uterine leiomyoma may also occur, causing acute pelvic pain. Usually, an enlarging fibroid without estrogenic support will regress. This is not the case in African American women whose leiomyomas will continue to expand.¹⁴ A very painful urinary calculi in the midureter with or without hematuria may be misdiagnosed as an acute gynecological event. A ruptured ectopic pregnancy in the 40- to 44-year age group may occur when a past PID or tubal surgery distorts tubal anatomy. Gastrointestinal etiologies may include an acute appendicitis, gastroenteritis colitis, and diverticulitis. Neurologic etiologies include herpes simplex and herpes zoster.

Postmenopausal women

Six percent of postmenopausal women develop acute pelvic pain from torsion of a malignant neoplastic ovarian mass.¹² The chance that a primary ovarian tumor is malignant increases with age. In women older than 50, the literature reports that at least 30% of tumors are malignant. Two examples are clear cell carcinoma and serous cystadenocarcinoma, prevalent in the 40- to 70-year age group. The most common symptoms of ovarian tumors are abdominal distension and abdominal pain accompanied with pressure on other surrounding structures. In one study, postmenopausal women presenting to the emergency department with acute pelvic pain with a suspicion of torsion were diagnosed less rapidly than younger women with similar pain symptoms. The median age for postmenopausal females in this study was 63 years, with an average time delay of 48 hours from diagnosis to surgical intervention. In contrast, an 8-hour time span elapsed for younger females with the same diagnosis and set of symptoms from time of presentation in the emergency department to surgery.^{15,16} Rupture of a cystic subtype malignant ovarian tumor such as a cystadenocarcinoma appears with an acute onset of pain. An acutely painful pelvis in a postmenopausal female may reveal an occult expanding fallopian tube carcinoma. Bulky enlarged leiomyomas also cause acute pelvic pain. Waning estrogen levels usually cause leiomatous regression in the postmenopausal period; however, there is a racial difference in ex-

pansion and contraction of fibroids. Fibroids in postmenopausal African American females continue to expand despite a decrease in estrogenic stimulation to the uterus.¹⁴ This is not the case in the white postmenopausal female. A herniated disc in the dermatone region of pelvic sympathetic and parasympathetic plexus may simulate an acute pelvic event as well as an acute musculoskeletal hematoma from a fall or other trauma. A femoral, inguinal, or incarcerated umbilical hernia may present with acute pain of the lower abdomen and pelvic region. Pain of an ischemic bowel or a ruptured lower diverticulum can be confused with an acute pelvic event. Herpes zoster before blister formation must be in the differential with unilateral acute pain along dermatone pathways. Lower pelvic pain of an osteoporotic pelvic fracture should cause the physician to question elder abuse or a silent fracture in a thin, fair-skinned white or Asian woman. The lower gastrointestinal acute pain of constipation in the elderly female may delay a diagnosis, especially an undiagnosed hypothyroid postmenopausal woman presenting to your office.

A discussion of acute pelvic pain begins with infectious presentations and continues with noninfectious pregnant and nonpregnant pathology. Each age group has specific etiologies and presentations of acute pain and may merge and overlap between different age groups.

Pelvic inflammatory disease

The acute pelvic pain of PID refers to an infection involving the upper genital tract encompassing the uterus, fallopian tubes, and ovaries.^{17,18} *Pelvic inflammatory disease* is a general term for acute, recurrent, or chronic infection of these organs. This polymicrobial infection rapidly involves the peritoneum and adjacent structures, resulting in endometritis, salpingitis, oophoritis, peritonitis, perihepatitis, or tubo-ovarian abscess. More than 100,000 women become infertile each year as a result of acquiring a PID. Each year 40% to 50% of ectopic pregnancies are attributed to a previous PID. After one episode of PID, a woman's risk of ectopic pregnancy increases seven-fold, and 12% of women become infertile after a single episode of this disease. Annually, more than 150 women and adolescents die from PID or its complications. It may be frustrating to the clinician to learn that diagnosing PID is imprecise as in the case of salpingitis. The positive predictive value is 65% compared with a laparoscopic predictive value of 90%.¹⁹ Combinations of testing that increase the specificity and sensitivity of diagnosing a PID must be used for an accurate emergent diagnosis. PID is most commonly acquired by sexual contact. The organisms most commonly associated include *Neisseria gonorrhoea* and *Chlamydia trachomatis*. Both may coexist in the symptomatic patient. Gonorrhea has a more rapid onset, whereas chlamydia may present insidiously. Other microorganisms of the vaginal flora have been associated with an ascending PID including the many anaerobic

flora *Streptococcus agalactiae* (group B *Streptococcus*), cytomegalovirus, *Mycoplasma hominis*, *Ureaplasma urealyticum*, and bacterial vaginosis. Rare cases of fungal, viral, and parasitic cases also may occur in the patient with PID.

Acute salpingo-oophoritis may also be acquired by aerobic or anaerobic ascending nonsexual infections during douching or medical or surgical procedures. The onset of a PID after the insertion of an IUD for pregnancy prevention is preceded by a foul-smelling vaginal discharge. Bacterial vaginosis may be the offending organism but a Gram stain and culture should be taken to isolate the organism or organisms.

The history may include abnormal vaginal bleeding such as menorrhagia, metromenorrhagia, fever $\geq 101^{\circ}\text{F}$ (38.3°C), dyspareunia, and recent abnormal yellow vaginal discharge. Physical examination will reveal a purulent mucocervical discharge and decreased bowel sounds. Cervical motion tenderness with diffuse tenderness in the lower quadrants is found on a bimanual examination. At times, the presenting symptom is an acute urinary tract infection masking the ascending pelvic infection with urethritis and dysuria. In addition, the presence of a positive organism on Gram stain, abundant numbers of white blood cells on a saline wet mount, and an elevated erythrocyte or C-reactive protein will add to the specificity and sensitivity of the testing for PID.

The ascending infection may lead to a tubo-ovarian abscess involving the ovary and fallopian tube. The abscess containing anaerobic and aerobic pathogens may at times wall off and invade the adjacent structures. Tubo-ovarian abscesses are a very serious complication of PID. If not discovered, they can lead to sepsis, shock, and death. Adolescents and women in many ethnic groups increase their risk of acquiring a PID with regular douching.⁹ Confirmatory laboratory findings involve a positive gram stain, culture, and leukocytosis. Transvaginal ultrasound imaging may accurately diagnose a pelvic inflammatory infection to a 95% accuracy degree. A thickened fluid-filled tube or free pelvic fluid will be observed. A transvaginal ultrasound will differentiate acute from chronic PID in the walls of the fallopian tube. Empiric treatment should be initiated in sexually active women at risk for PID. A pregnancy test should be taken before certain antibiotic treatment regimens because with the use of antibiotics, such as quinolone or doxycycline, are not approved for pregnant females and may cause harm to the fetus.¹⁹ The major complications of PID, if not in the differential and left untreated, include chronic pelvic pain, tubo-ovarian abscess, infertility, and ectopic pregnancy. Hospitalization may be required for acute surgical emergencies such as a suspected tubo-ovarian abscess or infectious pregnancy complications.

Endometritis

The pelvic pain of acute endometritis is defined as an ascending infection to the endometrium, with potential ex-

tension to the myometrium and the parametrial tissues. It may be included in the PID spectrum of ascending infections to the pelvis. It may also occur with surgical instrumentation as an ascending infection. Many types of organisms may cause endometritis including gonococcal and nongonococcal ascending anaerobic and aerobic organisms. Chlamydia, gonorrhea, group B *Streptococcus*, *Gardnerella vaginalis*, *Peptostreptococcus*, *Escherichia coli*, and other vaginal flora.²⁰ Endometritis not associated with pregnancy is more frequently associated with an ascending chlamydia infection. Acute endometritis affects females in the reproductive stage of life. Clinical manifestations may include dyspareunia, purulent foul-smelling vaginal discharge, abnormal vaginal bleeding such as menorrhagia, and acute pelvic pain. Physical examination will reveal abdominal distension, cervical and uterine motion tenderness, and a fever >100.4°F (38°C). The patient may present with tachycardia as well as constipation or pain with bowel movement. Acute endometritis may also be rarely associated with a recent uterine procedure that enters through the cervix, such as an IUD insertion, hysterosalpingography, and sonohysterography.²¹ Acute endometritis is characterized by the presence of neutrophils within the endometrial glands versus chronic endometritis with plasma cells and lymphocytes within the stroma on culture. Complications include pelvic peritonitis, infertility, and abscess formation in the pelvis or uterus.^{20,21}

Ovarian torsion

The acute pelvic pain of an ovarian torsion is usually related to the presence of ovarian cysts including dermoid cysts and neoplasms. These masses are predisposed to twist on their vascular supporting pedicle structure.²² Serous and mucinous cystadenomas are common benign ovarian neoplasms. Mucinous cystadenomas are usually multilocular and may enlarge to 20 cm. These do not naturally regress and may twist and cause acute pelvic pain.

A review of the surgically confirmed torsions in the literature reveals cystic torsion to be approximately 48% and neoplasms to be in the range of 46%. The remainder of torsions in normal ovaries may occur in 6% of adolescents or women. Rare occasions occur in newborns and children. This twisting of the ovary onto its suspensory ligamentous supports reduces the blood supply to the involved ovary.²² Arterial, venous, and lymphatic flow, as well as pelvic nervous plexus, is compromised with the result of acute pain in the region. Necrosis and the potential for gangrene of the ovary make this a surgical emergency. Suspicious symptoms include nausea and vomiting, stabbing pain, sudden sharp pain in the lower abdomen radiating to the back or flank, rebound tenderness on palpation, and sometimes fever. Principle findings include localized pain in the region at the site of a growing mass. Clinical suspicion and a bimanual examination should reveal the tender mass. Size, shape,

and consistency may be outlined by the hands of the examiner. A leukocytosis may be present. Most cases of torsion occur before 50 years of age and accounts for 2.7% of surgical emergencies.¹¹ Pregnancy is a great risk factor for torsion as well as women with hyperstimulation for ovulation induction. The incidence in one series of women undergoing infertility treatment was 8%. In the postmenopausal age group, it is rare except in the cases of ovarian neoplasms. Magnetic resonance imaging, computed tomography scan, and ultrasound are limited in diagnostic acumen when diagnosing torsion. Surgical evaluation is the mainstay of diagnosis and treatment.

Ruptured ovarian cyst

Acute pelvic pain of a ruptured ovarian cyst presents with unilateral lower abdominal pain. These cysts are either corpus luteal, follicular, serous, or dermoid.²³ Other types of ovarian ruptured cysts include cystadenoma and endometrioma. Intercourse or strenuous exercise is often the exacerbating cause of an enlarged cystic rupture. Hemoperitoneum and a bloody vaginal discharge may resemble ectopic pregnancy rupture without a positive pregnancy test. Peritonitis does not occur with the mucinous fluid such as a cystadenoma; however, if this rupture is caused by a dermoid cyst, the irritating sebaceous seepage causes a chemical peritonitis and rebound tenderness. Ovarian hyper-stimulation syndrome with the sequelae of cystic rupture should be in the differential diagnosis when infertility treatment is part of the patient's recent history.¹⁴ Mittelschmerz with ovulation and a ruptured corpus luteum may cause acute pain in a woman of reproductive age. Peritoneal irritation because of leakage of the cyst may lead to pelvic fullness, rebound tenderness, and significant pelvic pain. A pelvic examination should reveal tenderness in the region of the cul-de-sac because of the gravity effect during the rupture. Tenderness on the side of the rupture will be noted on deep palpation. A pelvic sonogram will detect the simple or complex structure when hemorrhage has occurred with the rupture. Resolution occurs within 4 to 6 weeks. If acute hemorrhage and hemodynamic instability ensues, the patient should be taken to surgery for aspiration of the cyst, with the visual aid of a laparoscope.²³

Light vaginal bleeding from endometrial breakdown as hormone levels drop may be seen with the aid of a speculum examination. A patient with a history of sickle cell anemia or a patient with a history of coagulation defects may have acute pelvic pain if a hemoperitoneum occurs.

Dysmenorrhea

The acute pelvic pain in reproductive women during menses without pelvic disease is known as primary dysmenorrhea. Primary dysmenorrhea occurs with ovulatory cycles. The

etiology of pelvic painful uterine contractions in primary dysmenorrhea is caused by decreasing blood flow to the myometrium with ischemia.¹⁴ Cramps are intermittent and intense. Dysmenorrhea is directly related to the duration and amount of menstrual flow. Prostaglandins released from the endometrium at menstruation appear to be the etiology of primary dysmenorrhea, especially PGE2 and PGF2. The sources of acute pelvic pain in women with primary dysmenorrhea are those with a greater than usual production of prostaglandin in their endometrium.¹⁴ Women with minimal cramping do not produce this quantity. Acute cramping pain is located in the suprapubic region with radiation to the lower back. A careful history and a normal pelvic physical examination should accurately diagnose primary dysmenorrhea.

The severity of secondary dysmenorrhea is associated with pelvic pathology. Some examples include endometriosis, uterine leiomyoma, adenomyosis, and PID. Other examples of secondary dysmenorrhea causing acute pelvic pain or chronic pelvic pain are anatomic lesions in the genital tract such as imperforate hymen, intrauterine adhesions, or endometrial polyps.²⁴

Neoplasm

Acute pelvic pain of a neoplasm results from rupture, hemorrhage, torsion, bulk pressure, distention, ascites, or invasion to other pelvic structures. An early ovarian cancer is insidious and pain is the last symptom until ascites and bulkiness of the mass cause gastrointestinal discomfort. Laboratory analysis of CA-125 tumor marker is not specific for ovarian cancer; however, levels >65 U/mL are sensitive for advanced cases. An elevated CA-125 in a postmenopausal woman has a positive predictive value of 97%. A rare etiology of an acute pelvic pain from neoplasm is an acute lymphoblastic leukemia mass to the ovary. A careful history will assist in a differential diagnosis of a gastrointestinal (Krukenberg) tumor arising from metastatic breast disease. Invasive adenocarcinoma of the fallopian tube is rare and accounts for <1% of gynecological cancers. The average occurrence of adenocarcinoma of the fallopian tube occurs primarily in the infertile patient 50 years or older. The pain is usually colicky and accompanied by painful vaginal bleeding and a watery leukorrhea. Distention of the tubal wall and peristalsis is the cause of this pain.

Uterine sarcomas, a rare aggressive form of uterine cancer, arise from the endometrium and myometrium. The mean age is 60 years old in postmenopausal women. It is often misdiagnosed as an enlarged leiomyoma. The pain is associated with expansive pressure. Other symptoms are postmenopausal vaginal bleeding and abdominal distention related from pressure to adjacent organs.

In general, nonmalignant tumors grow by expansion and compression, and they are well demarcated from the surrounding tissue.¹⁵ Malignant tumors grow by invasion, in-

filtration, and destruction.²⁴ A bimanual examination with added rectovaginal and abdominal palpation will assist in defining position and size of the mass. Radiologic support will further define the size, shape, solidification, or cystic nature of the mass.

Endometriosis

The acute pelvic pain of endometriosis, a disease among women of reproductive age, is associated with growths histologically resembling the endometrium tissue. The size of the endometrial implants does not correlate with the acuteness of pelvic pain. The severity is postulated to be a result of the depth of endometriosis implants on the surfaces of organs or adhered ligaments of adjacent pelvic surfaces. Pain has three origins: pain from focal bleeding, pain from endometrial implants, and pain from inflammatory cytokines, infiltrating the pelvic nerves.¹⁴ Surgery is required for staging and diagnosis. Women at risk have earlier menarche, shorter menstrual cycle lengths, altered humeral and cell-mediated immunity, and, possibly, a genetic predisposition. Abnormalities in expression of cellular adhesion factors have been described. The pelvic pain appears during the premenstrual period and is likely to be associated and dependent on estrogen production and altered prostaglandin metabolism. Affected patients may describe dysmenorrhea, dyspareunia, lumbar sacral backaches, and pain with bowel movements. Many women have infertility challenges. Physical examination may reveal a fixed, tender, retroverted uterus; adnexal tenderness; and tender uterosacral nodules along the posterior vaginal fornix. Deposits in the uterosacral ligaments and rectovaginal area illicit pain during intercourse, as well pain with bowel movements. Extra pelvic endometriosis may mask gastrointestinal and other organ symptoms. These endometriomas must be differentiated from ruptured hemorrhagic ovarian cysts, which regress and resolve, rather than continual growth on follow-up ultrasound as seen in endometriomatous growths.^{24,25}

Leiomyoma

An infarcted leiomyoma, a benign tumor arising from the myometrium, may cause acute pelvic pain in certain ethnic groups and women of color. Leiomyoma are subjected to torsion, infection or infarction. A pedunculated leiomyoma may twist on its pedicle and the pain may present as acute in the abdomen. Leiomyomas are highly estrogenic, with a vast network of estrogen and progesterone receptors.¹⁴ Abnormal uterine bleeding from a submucosa myoma may reveal marginal hyperplasia. Acute pain occurs from necrosis and vascular compromise. Pain may also occur in an attempt by myometrial contractions to expel the subserous myoma. Myomas express abnormal angiogenesis with dilated venous plexus and endothelial growth factor abnormalities.¹⁴ Race is a significant

factor in leiomyomatous growth. African-American women have a three-fold relative risk of developing fibroids than white women. Fibroids in African-American women after the age of 35 years grow at a faster rate than in white women, whose fibroids regress.^{14,25} Physical examination reveals an asymmetric, tender, solid mass palpated alongside the uterus or within the uterus. It may appear enlarged, tender, bulky, or irregular during bimanual palpation. Women usually provide a history of increased uterine bleeding, pelvic pressure, and severe anemia at times. Urinary symptoms may be present with an anterior fibroid. A transvaginal ultrasound will assist in the diagnosis.

Pregnancy-related causes of acute pelvic pain

Ectopic pregnancy

Chief presenting symptoms of ruptured and unruptured ectopic pregnancies are the triad of abdominal pain, amenorrhea, and vaginal bleeding. An unruptured ectopic pregnancy elicits pain secondary to distention of the fallopian tube or other extra uterine site where it is implanted. This high-mortality diagnosis should be considered in women of reproductive age who have specific risk factors: the use of a progesterone-only oral contraceptive, a history of salpingitis, and/or previous tubal surgery to include a tubal ligation for permanent sterilization.^{26,27} Other causes contributing to an ectopic pregnancy include PID, ovulation induction and assisted reproductive techniques, adhesion history from nontreated infections such as chlamydia, and women with adhesions from endometriosis. In one study in France, a woman smoking more than 20 cigarettes per day was at greater risk for an ectopic pregnancy. The study was inconclusive; however, a parallel between the women who smoked and high rates of pelvic infection appeared in the data.²⁸ Diagnosis is based on history and clinical findings. Physical findings include diffuse or localized abdominal tenderness, cervical or adnexal motion tenderness, and a bimanual examination revealing a tender, soft-top, normal-sized uterus. A bimanual examination may also illicit acute pain from seepage of blood or hemoperitoneum if the ectopic pregnancy has ruptured either iatrogenically or from distention. Hemodynamic instability occurs if the ectopic pregnancy ruptures. The extra-uterine pregnancy is usually in the fallopian tube but also may occur in the cervix, ovary, or abdomen. A quantitative BhCG and transvaginal ultrasound examination to detect the presence of a gestational sac are the most useful diagnostic tests.

Abruptio placenta

The separation of the decidua with its placental attachment in a third-trimester pregnancy, including active labor, is considered an obstetric emergency. It is defined as a decidual hemorrhage from the site of uterine implantation, leading to premature separation of the placenta before de-

livery of the fetus. The acute pain of premature separation of the placenta is a clinical diagnosis. An abruptio serious enough to result in stillbirth occurs in 1.2 per 1000 births.^{29,30} Incidence is in the third trimester of pregnancy, including during active labor. It is the most common cause of maternal death caused by bleeding. Eighty percent of abruptions are incomplete, whereas 20% are complete and cause severe complications to the mother and infant. Predisposing and precipitating factors include pregnancy-induced hypertension, chronic hypertension, trauma to the abdomen, previous abruptio, over-distention of the uterus with multiple gestation, polyhydramnios, and maternal bleeding disorders such as maternal thrombophilia disease, diabetes, systemic lupus erythematosus, leiomyomas, and cocaine use.^{29,30}

Symptoms of acute abruptio include uterine contractions with uterine hyper tonicity, abdominal and back pain, and at times vaginal bleeding. The uterus may become rigid and tender to palpation. Hemodynamic changes with tachycardia and hypotension will occur with maternal complications of hypovolemic shock, disseminated intravascular coagulopathy (DIC) with amniotic fluid embolism, maternal death, and intrauterine fetal demise if this diagnosis is missed. Labs must include coagulation studies. Blood should be typed and crossed for at least four units. A large-bore intravenous catheter is placed for intravenous fluids to assure hemodynamic stability. An intrauterine pressure catheter is placed to monitor for high intrauterine resting tone. Vaginal delivery is attempted if separation is not acute and fetal heart rate is reassuring. Cesarean delivery is indicated when maternal and fetal compromise is diagnosed.

Spontaneous abortion

The expulsion of an embryo or fetus weighing 500 grams or less before 20 weeks' gestation is termed a *spontaneous abortion*.³¹ It is the most common complication of pregnancy. A complete abortion is the expulsion of all of the products of conception before the 20th completed week. An incomplete abortion is the expulsion of a portion of the products of conception. A first trimester pregnancy that aborts spontaneously may cause severe pelvic pain as it disengages from the maternal uterus. The history may include a missed menses, vaginal bleeding, and pelvic pain.³¹ Physical examination reveals a dilated cervical os with products of conception seen either extruding from the external os or in the vagina. With an incomplete abortion, pain may bring the patient to a health care facility. On examination, the cervix may be partially open or closed and bleeding may or may not be present. The pregnancy test is positive and an ultrasound will add to the accuracy of the diagnosis. Unless the woman with a first trimester spontaneous abortion hemorrhages, expectant management is appropriate. With a more advanced pregnancy, severe bleeding may produce hypovolemia and shock. An emergency dilation and curettage is needed if the clinician observes heavy

vaginal bleeding, a noncontracting uterus, and a dilated cervical os. A pregnant woman with fever, chills, abdominal pain, vaginal bleeding, and a sanguino-purulent vaginal discharge may present with a septic complete or incomplete abortion. On physical examination, the septic patient presents with tachycardia and a boggy very painful, tender, dilated uterus.

Nongynecological causes in the differential diagnosis of acute pelvic pain

Gastrointestinal—Appendicitis, bowel obstruction, gastroenteritis, incarcerated hernia, irritable bowel disease, regional ileitis, ulcerative colitis, ischemic bowel, diverticulitis

Urologic—Acute pyelonephritis, urethritis, acute renal calculi

Musculoskeletal—Acute strain or sprain, pelvic asymmetry, herniated disc, lumbar sacral epidural abscess

Vascular—Sickle cell crisis

Trauma—Ruptured viscus and bowel or bladder perforation^{24,32}

Conclusion

The challenge of arriving at a differential diagnosis of acute pelvic pain demands from the practitioner an orderly thought process integrating the art and scientific knowledge of the presenting symptoms. Body language and habitus together with the chief complaint initiates further evolution of the differential diagnosis. Factors such as reproductive age, history of present illness, and sexual and menstrual history begin the quest. Past medical and surgical history layer the database to a possible problem. The physical diagnosis and laboratory and radiologic modalities will resolve a life-threatening acute event and prevent further morbidity and mortality.

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