REVIEW

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Masquerade: Medical causes of back pain

ABSTRACT

Back pain has many causes, and 95% of cases are due to benign, self-limiting problems. Most problems are musculoskeletal and are relieved with rest and nonsteroidal medications. However, some serious and life-threatening medical conditions also can present as acute back pain.

KEY POINTS

The history and physical examination are critical in determining the cause of low back pain. The character and location of the pain and the associated symptoms are all clues that can help determine the cause.

The diagnosis of uncommon but potentially lethal disorders requires heightened suspicion and an appropriate differential diagnosis.

Patients with severe, acute back pain should be given careful consideration, as an abdominal examination may just save their life.

*Dr. Orr has indicated that he has received honoraria for teaching and speaking from the Kyphon and Medtronic corporations.

MOST CASES OF BACK PAIN are caused by sprains, strains, or degenerative changes in the muscles, disks, and connective tissues of the back itself. Sometimes, however, back pain can be triggered by medical disorders more or less unrelated to the spine. Recognizing these disorders for what they are is important to avoid delayed diagnosis and to prevent serious illness or death.

In this paper we discuss the serious medical conditions that sometimes masquerade as back pain, focusing on the most critical problems we can least afford to miss: the emergent, urgent, and potentially serious medical causes of back pain.

BACK PAIN IS COMMON AND USUALLY BENIGN . . .

Low back pain has been estimated to occur in 50% to 80% of all Americans and in 10% of the population in a given year.[1] It occurs in both men and women, but is more common in women as they age, perhaps as a result of increasing incidence of osteoporosis. The pain is usually nonspecific, such as muscle pain or a dull ache in the lower back. The exact cause is usually elusive, and the pain may have started with a benign event.

Back pain usually is self-limiting and resolves with rest and nonsteroidal anti-inflammatory drugs (NSAIDs). But if it persists, patients may present to their primary care physicians, and back pain is the second most common reason for visits to primary care physicians, behind only colds and the flu.[2] With such a high incidence, an extended course to recovery, and the need for specialized diagnostic tests and treatments,

TABLE 1

Medical conditions that can masquerade as back pain

Emergent conditions
Dissecting aortic aneurysm
Ectopic pregnancy
Myocardial infarction

Urgent conditions
Acute pancreatitis
Duodenal ulcers
Pyelonephritis
Visceral trauma

Potentially serious conditions
Cholecystolithiasis
Endometriosis
Fibroids
Nephrolithiasis
Pelvic inflammatory disease
Pregnancy
Prostatitis
Urinary tract infection

TABLE 2

Symptoms that raise suspicion of a medical condition in a patient with back pain

Abdominal pain
Colicky pain
Costovertebral angle tenderness
Diaphoresis
Excruciating pain
Fever
Hypertension, hypotension
Pain at rest or at night
Shock

Back pain is the second most common reason for visits to primary care physicians, after flu-like symptoms

spinal disorders are estimated to cost in the tens of billions of American health care dollars.[1]

Acute musculoskeletal back pain usually begins to improve after 2 to 5 days and typically resolves in less than 1 month. It is usually attributed to muscular strains or minor disk injuries. Chronic back pain has a more insidious onset and lasts longer than 3 to 6 months. It can be due to disk desiccation or degeneration, herniated disk fragments, lumbar stenosis, scoliosis, or a variety of other spinal conditions.[3,4] Many patients with chronic back pain are referred to medical or surgical spine specialists for consultation and evaluation.

. . . BUT SOMETIMES INDICATES SOMETHING SERIOUS

Pain that is severe, refractory, or atypical in location or character, or with particular features, should trigger concern about a more dangerous, visceral cause. Recognizing these atypical features will allow the physician to rapidly focus the diagnostic evaluation and avoid missing a serious, potentially lethal condition that may masquerade as common back pain.

The visceral structures that surround the spine have nonspecific nerve endings that can refer pain from that organ to the back. The causes of visceral pain can be elusive, and reaching the correct diagnosis can be challenging. In addition, many radiographic findings may be found that seem to explain the back pain but are actually clinically unrelated.

To derive the correct diagnosis we first must have a framework in which to evaluate the patient. Before concluding that atypical pain has a spinal source, we need to consider a variety of medical conditions, including visceral disorders, infections, tumors, and metabolic bone diseases (TABLE 1).

HISTORY AND PHYSICAL EXAMINATION: THE BASICS

The key to accurate diagnosis is a good history and physical examination.

History of the present illness comes first and should include the location of the pain, its character (eg, burning or sharp), and when it occurs. Back pain that becomes more prominent at night or with rest raises the concern of a malignant process (TABLE 2). We must inquire about fevers or general malaise and urinary function. Known metabolic disorders should also be taken into account.

The medical history should be detailed but pertinent and should include any similar back problems, cancer, or trauma, both long ago and recent. General medical conditions and confounding medical problems (eg,

human immunodeficiency virus infection, immunocompromised state) should be determined. A surgical history may also yield some helpful information and should include any back or abdominal surgery. The social history must include questions about smoking and intravenous drug use.

A careful physical examination is paramount and should focus on the back to identify typical spinal abnormalities. Cardinal neurologic signs that require emergency referral to a spine specialist or emergency department include major muscle weakness, absent sphincter control (loss of bowel or bladder control), or saddle anesthesia (loss of sensation in the perineum), as these can be due to cauda equina syndrome. These symptoms raise the concern of acute neurologic deterioration and nerve compression, which may require emergency surgery to alleviate the pressure on these nerves. Likewise, severe, focal pain associated with significant trauma (eg, a fall or motor vehicle accident) warrants an immediate radiographic evaluation. Examination of the associated visceral organs is also critical, as is an examination of the abdomen, noting the location and intensity of any tenderness.

Imaging studies. If back pain does not respond to conservative management, radiographs should be obtained. More advanced studies such as magnetic resonance imaging should initially be reserved for patients with neurologic findings.

While neurologic deterioration raises the concern of a spinal condition, an unusual presentation of back pain may raise the suspicion of a medical condition. The accurate and timely diagnosis of some medical conditions can prevent serious complications.

EMERGENT CONDITIONS

Some patients who walk into the clinic or call on the telephone with the complaint of back pain actually have a medical emergency. Although this presentation is uncommon, back pain can be the initial symptom of a serious, potentially lethal visceral disorder. Occasionally, back pain is the only presenting symptom of a true medical emergency.

This kind of back pain usually differs in intensity and character from musculoskeletal back pain. The differences can be subtle, however, and referred pain from infra-abdominal and retroperitoneal organs can lead to confusion unless the physician makes it a point to consider these specific disorders in patients with atypical back pain (FIGURE 1).

Aortic aneurysm

Back pain that is acute, severe, and "tearing" may be the initial symptom of a dissecting aortic aneurysm.[5–8] The difference between this presentation and an acute musculoskeletal injury can be subtle but important to distinguish, as the pain associated with aneurysm may be the harbinger of a complete dissection, exsanguination, and death.

Aortic aneurysms occur in 1% to 4% of people older than 50 years and kill 10,000 people each year. They may be familial, and they are four times more common in men than in women. By far, most occur in the abdominal aorta (FIGURE 2), but some occur in the thoracic aorta.[9]

The etiologic process is a combination of hypertension and atherosclerosis, which allows the descending aorta to dilate. Patients with abnormal collagen (eg, those with Marfan syndrome) have a higher risk of aortic dilatation and a higher incidence of dissection.

Occasionally, back pain is the only presenting symptom of a true medical emergency

Certainly, however, not all aortic aneurysms will dissect. The risk factors include a size greater than 6 cm and uncontrolled hypertension. While asymptomatic aneurysms smaller than 5 cm can be monitored conservatively, aneurysms larger than 6 cm have a rupture rate of approximately 10% per year.

On examination, some patients have a pulsatile abdominal mass, most easily palpated with the patient supine with knees flexed. The sensitivity of abdominal examination is 68% but can be as high as 91% in thinner patients. Computed tomography (CT) and ultrasonography have sensitivity rates approaching 100% when used for confirmation.[10]

With a sentinel dissection, patients become diaphoretic and may complain of severe abdominal pain. Although only 12% have symptoms of back pain, this pain can

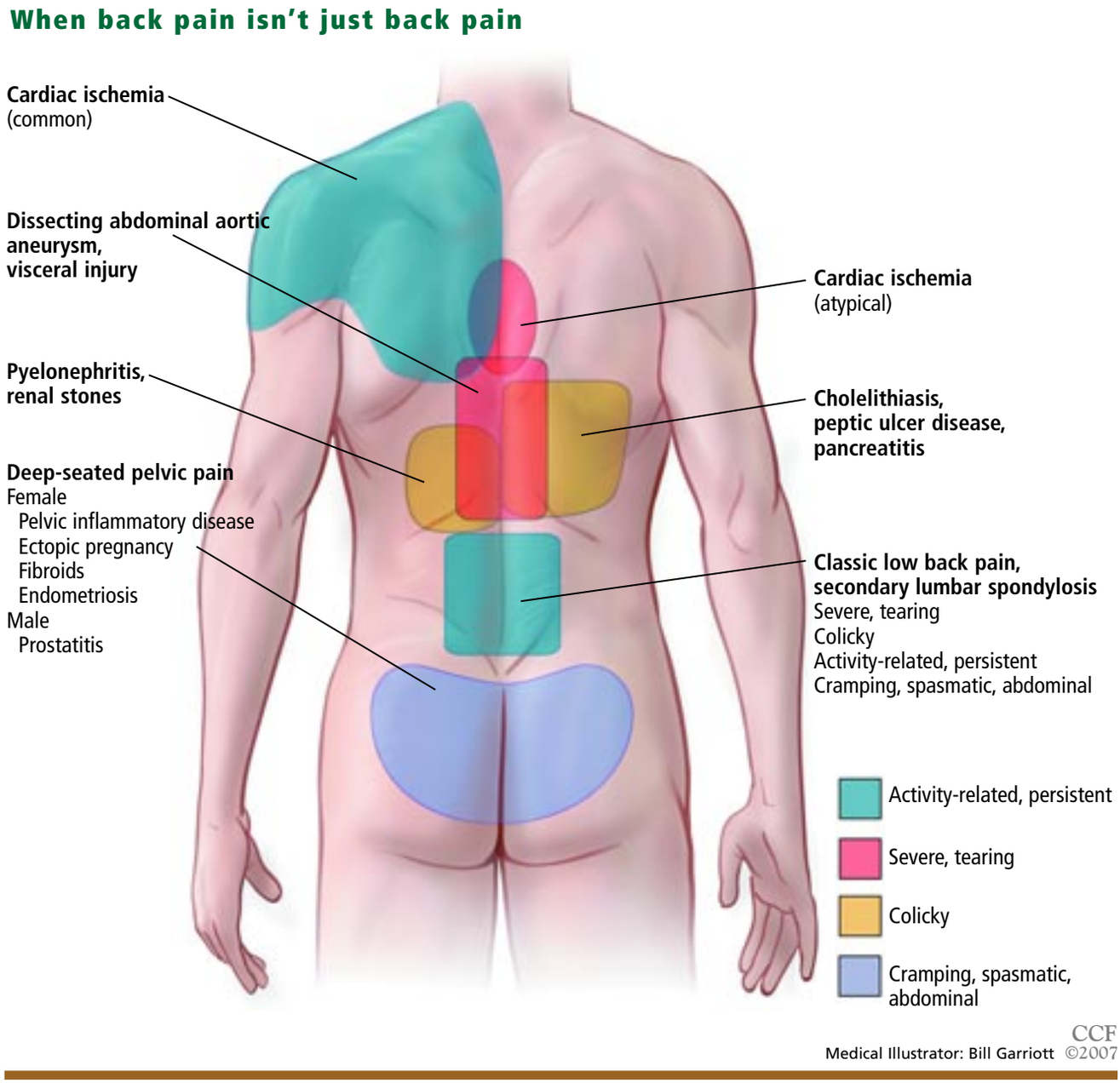

FIGURE 1. Schematic drawing of the location of atypical back pain and the possible medical conditions that the pain may represent.

predominate; it is described as severe, tearing or ripping, and intolerable.[7]

The location of the pain may reflect the location of the aneurysm. Ascending aortic aneurysms may cause pain that radiates to the anterior chest. Arch aneurysms may cause pain that radiates to the neck. Descending thoracic aneurysms may cause pain that radiates to the intrascapular region. Aneurysms located at the diaphragmatic hiatus may cause pain in the mid-back.

The back pain symptoms, if present, are usually intense, unbearable, are localized to the thoracolumbar junction or interscapular area, and occur suddenly (FIGURE 1). Palpation over the back and changes in position do not aggravate the pain, nor does rest relieve it. Palpation of the abdomen may increase the

symptoms, however. Patients experiencing acute dissection may writhe in pain or pace incessantly, unable to find a position of comfort. Progressive dissection can cause a loss of lower extremity pulses, and the location of the back symptoms may migrate as the dissection progresses proximally.

A dissecting aneurysm is a true medical emergency, as it can lead to rupture of the aorta and rapid internal exsanguination. The mortality rate during elective reconstruction is less than 5%, while the risk of dying if an aneurysm ruptures can be much greater. The key to survival in an evolving dissection is emergency surgical stabilization, either with an open reconstruction or with newer endovascular stents.[9,11]

Abdominal aortic dissection

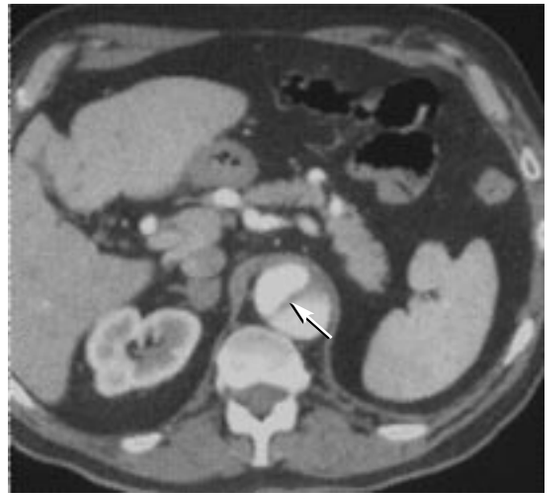

FIGURE 2. Axial computed tomographic scan of a suprarenal abdominal aortic aneurysm with dissection. Note the double lumen (arrow).

Myocardial infarction

Another medical emergency that can present as back pain is myocardial infarction (MI). The back pain is unusual in that it is midthoracic and may radiate to the arm or axilla. Patients can have some or all of the following symptoms: anterior chest heaviness, crushing chest pain, diaphoresis, shortness of breath, nausea, vomiting, a sense of impending doom, and pain radiating to the shoulder, neck, arm or arms, or back.[12,13]

MI is a leading cause of illness and death in the United States, with 1.3 million cases of nonfatal MI per year and a prevalence of 600 per 100,000 people. This common and deadly disease usually occurs in people older than 45 years, with a male predilection. From 500,000 to 700,000 people die of MI each year in the United States.[14] Risk factors include smoking, hypertension, diabetes, hyperlipidemia, obesity, cocaine use, hypercholesterolemia, and a positive family history.

In young patients or those who present with atypical symptoms, the diagnosis can often be missed on initial evaluation. Anginal symptoms can be vague and nonspecific, especially in women, the elderly, and those with diabetes.[15]

Patients with back pain caused by myocardial ischemia typically experience substernal and left upper extremity symptoms as well, but not always. Back pain associated with myocardial ischemia is variable and may include deep, boring, interscapular pain, as well as left scapular pain or pain across the entire back. This pain may be unaffected by posture or changes in position. Nausea, vomiting, diaphoresis, and a sense of impending doom are commonly associated with pain due to MI, and not with musculoskeletal causes of upper back pain. Pain that radiates to the left or both arms, that is associated with changes in blood pressure or cardiac function, or that is associated with a sense of impending death indicates a serious medical condition until proven otherwise.

The risk of dissection is greater with aneurysms > 6 cm and uncontrolled hypertension

The key to rapid diagnosis is to elicit any complaints of chest pain, malaise, or dyspnea, and to look for the signs and symptoms mentioned above. These symptoms are especially worrisome in patients with one or more risk factors. If MI is suspected, serial electrocardiography and measurements of cardiac enzymes are indicated. Advanced imaging, ie, echocardiography, may also help.

Oxygen, beta-blockers, sublingual nitrates, and aspirin are the mainstays of emergency treatment. If these agents alleviate the back pain, be very concerned and work the patient up for an MI. Observation for 24 hours is also necessary to rule out any ischemic event. Treatments for coronary artery disease include pharmacologic thrombolysis, percutaneous intervention, and coronary artery bypass grafting. When MI masquerades as back pain, the

key to patient survival is early recognition and treatment.

Ectopic pregnancy

Severe low back pain associated with abdominal discomfort in a sexually active female patient should raise the suspicion of a tubal pregnancy.[16] The classic triad of symptoms of ectopic pregnancy in menstruating women is missed period, vaginal bleeding, and abdominal (or low back) pain. The back pain is typically in the low pelvis or back and can be intermittent and deep. Patients may be in severe pain and may also be diaphoretic and shocky.

One in every 40 to 100 pregnancies is ectopic.[17]

Tubal ectopic pregnancy is a medical emergency, as continued growth of the fetus will lead to rupture of the fallopian tube and potentially fatal intra-abdominal hemorrhage. Ectopic pregnancy can also occur in the abdomen, ovary, or cervix; the risk of hemorrhagic complications is lower in these conditions. The most common cause of a tubal pregnancy is abnormal scarring and deformation of the fallopian tubes, so that the fertilized egg cannot progress normally from the ovary to the uterus. This scarring may be due to abdominal surgery, cesarean section, or any condition that causes pelvic inflammation (eg, salpingitis or pelvic inflammatory disease).

Tubal ectopic pregnancy is a medical emergency

The clinical examination usually elicits abdominal cramping, but tubal rupture can present as severe sharp abdominal pain, back pain, or neck pain. In 20% of ruptured ectopic pregnancies, the presenting symptoms include hypovolemic shock. Tests for beta human chorionic gonadotropin can determine the pregnancy status. Ultrasonography of the abdomen, uterus, and fallopian tubes can confirm and determine the location of the embryo.

Treatment is determined by the state of health of the mother and by whether the fallopian tube has ruptured. With rupture or shock, emergent laparotomy is necessary to control the bleeding.

Clearly understanding the symptoms before rupture is critical. When back pain is the presenting symptom, it is usually localized to the dermatomes associated with the origin of the pelvic organs—L1 and L2. Thoracolumbar back pain that is associated with abdominal and peritoneal pain should trigger suspicion of a genitourinary cause, and when the pain is sharp, progresses suddenly, and is accompanied by symptoms of nausea, diaphoresis, or shock, then ectopic pregnancy must be suspected and ruled out. If identified early, before the fallopian tube has ruptured, ectopic pregnancy can be treated by pharmacologic abortion or urgent laparoscopy to remove the fetus.[17]

URGENT CONDITIONS

Trauma

Many patients with back pain have a history of trauma. Spinal trauma and related pathology can be easily evaluated and are the obvious initial concern in most cases.

It is important not to focus on spinal trauma to the exclusion of other, potentially life-threatening injuries, however. Retroperitoneal organs and the duodenum, which lie just anterior to the spine, may be injured, and the pain associated with this injury can be referred to the lower back. Blunt trauma can initiate pancreatitis or result in retroperitoneal hematoma.

Imaging of the spine is required, with plain radiography and computed tomography (CT) to determine the bony pathology. At the same time, imaging of the abdomen can rule in or rule out intra-abdominal or visceral injury. In adolescents, a cause can be determined in 50% to 60% of all cases.[3]

Trauma to the kidney can result from a direct blow to the posterior flank; signs and symptoms may include hematuria and constant, vague, aching low back pain. This pain is usually deep and may radiate to one flank or to the groin; it can be difficult to localize. The physician must perform a directed examination to determine costovertebral angle tenderness and a urinalysis to determine the presence or absence of blood.

In children with splenomegaly due to sickle cell disease or Epstein-Barr virus, the enlarged spleen is at particular risk of injury and rupture.

Duodenal injuries may occur with a flexion-distraction injury, also known as a Chance fracture.[18] These injuries typically

occur in children who were wearing seatbelts at the time of a motor-vehicle accident. Patients complain of severe back discomfort that may be accompanied by nausea and vomiting. They may also have the classic periumbilical hematoma from the visceral injury and bleeding.

For all of these injuries, prompt diagnosis is critical. Abdominal CT can help determine the exact nature of the injury and the best course of action.

Acute pancreatitis

Acute pancreatitis is another cause of thoracolumbar back pain.[19] Inflammation of the pancreas occurs after obstruction of the pancreatic duct and can be triggered by binge drinking or gallstones. Abdominal and back pain with a history of drinking should raise one's suspicion, as should a history of pancreatitis, as the pain may represent residual disease.

The back pain in these patients may be deep-seated and often may be localized to the mid-back. Serum amylase and lipase levels may be abnormal, which will help direct the appropriate therapy.

If left untreated, acute pancreatitis can become chronic. In this condition the pancreatic enzymes can become activated and begin digesting the pancreas itself, leading to significant tissue destruction and warranting surgical intervention or percutaneous drainage.

Duodenal ulcers

Duodenal ulcers can also cause vague abdominal and back pain that may worsen with hunger or with high acidic levels in the stomach and lessen with ingestion of antacids. The pain may be in the upper or mid-back and can be sharp and stabbing.

Peptic ulcers are the result of inflammation and resultant injury to the mucosal lining of the intestinal tract. The ulcer is usually associated with *Helicobacter pylori* infection or with ingestion of specific medications, eg, NSAIDs.

A variety of tests can confirm the diagnosis, including *H pylori* blood tests and endoscopy. A delay in diagnosis can result in upper gastrointestinal bleeding and significant morbidity.[20] If the ulcer perforates, life-threatening peritonitis can result.

POTENTIALLY SERIOUS CONDITIONS

Adolescents and young adults have relatively high rates of trauma. They are also more likely to be sexually active, with those added concerns. In this population, back pain can be referred from inflammation of the genitourinary organs. Pelvic inflammatory disease is classically associated with vaginal discharge and pruritus, but some sexually transmitted diseases may have a more subtle presentation.

Gynecologic conditions

Gynecologic conditions such as endometriosis, menstrual cramps, fibroid tumors, and pregnancy can cause low back pain in women.[21] Symptoms, when present, are usually mild and can include low back pain, lower limb pain, heavy menstrual bleeding, spotting between periods, pelvic pain, painful intercourse, and urinary frequency.

Endometriosis. Nearly all women with endometriosis pain experience it in the pelvic area. The pain is often severe cramping that occurs on both sides of the pelvis, radiating to the lower back and rectal area and even down the legs. The severity of pain varies widely and is not related to the extent of the disease.

In any woman of reproductive age, keep in mind that she might be pregnant

Some of the other signs and symptoms of endometriosis are lower abdominal pain or pelvic cramps, pain during or after sexual intercourse, spotting, heavy or long periods, pain with bowel movements, fatigue, and infertility. When low back pain is associated with any of the above symptoms, a careful gynecologic examination, including pelvic examination, should be performed. This, along with ultrasonography, CT, or laparoscopy may confirm the diagnosis.

Normal ovulation can also result in low back pain,[22] associated with the increase in hormonal production. Ovulation associated with pain in the mid-cycle is called mittelschmerz. This is a normal process of the ovulatory cycle but may be mistaken for a back disorder.

Pregnancy. Many women experience back pain and sciatica during the course of pregnancy. Pain can be due to referred pain from visceral compression or direct compression on the exiting nerve roots. Normal uterine pregnancy may result in increased pain as

the fetus presses against the sacrum during the later stages of pregnancy; this may also be the presentation of the onset of labor.

In any woman of reproductive age, keep in mind the possibility that she might be pregnant. Always ask about and perform diagnostic tests for pregnancy status.

Urinary tract infections must be high in the differential diagnosis for women with low back pain and any urinary symptoms.[23] The pain is across the low back and radiates to the groin. Many patients have dysuria, urgency, and frequency. The definitive diagnosis can be made with a urinalysis and urine culture; more than 100,000 colony-forming units indicates a urinary tract infection. These infections can usually be treated effectively with antibiotics.

Urinary tract infections can ascend and affect the renal system directly as pyelonephritis. In these cases, the pain is much more severe and may radiate to the flank or upper back. Pyelonephritis may result in high fever and costovertebral angle tenderness, and percussion over the costovertebral angle may cause severe pain. The clinical diagnosis of pyelonephritis is usually made with the history, physical examination, and a positive urinalysis. The definitive diagnosis can be made with CT. This is not needed in most cases but may be helpful when the diagnosis is in doubt or when a diagnosis of a perinephric abscess is considered. Failure to diagnose may lead to pelvic inflammatory disease, infertility, renal failure, and sepsis.

Back pain that is worse at night raises the concern of cancer

Prostatitis

Prostatitis can affect young and old men and is characterized as a fever and vague aching pain in the low back that radiates to the rectum. The cause can be elusive and may be related to an autoimmune disease, remote trauma, or a bacterial infection.[24] A subtle infection with sexually transmitted diseases such as *Chlamydia* species may also be the culprit. Rectal examination reveals a tender and inflamed prostate.

Gallstones

Cholecystolithiasis indicates gallstones in the biliary tract; choledocholithiasis indicates gallstones in the common bile duct. Stones form when there is an imbalance between the bile salts, cholesterol, and bilirubin, and often can exist for years without symptoms. The classic profile of the patient with symptoms is the "four Fs": fat, female, fertile, and forty.

Sludging in the gallbladder and associated ducts allows gallstones to form and, once these ducts become blocked, may result in severe abdominal or back pain when fatty meals are eaten.[25] This pain is colicky, with sharp episodic pains occurring at intervals, with periods of improvement and relief.

The diagnosis is usually made with a careful history about eating; ultrasonography usually confirms the diagnosis.

Kidney stones

Kidney stones are common in middle-aged men and women. Calculi form from insoluble calcium deposits in the urine. While small stones may pass without incident, large stones can become incarcerated in the ureter and urethra. This interruption of urine flow combined with ureteral spasm is exquisitely painful and colicky, radiating from the thoracolumbar region and costovertebral angle laterally into the flank and around to the lower abdomen and groin. The pain is thought to increase with the peristalsis of the ureter as it attempts to eliminate the stone.[26]

Urinalysis can usually determine if blood is present, and plain radiography or CT of the abdomen and retroperitoneum can confirm the diagnosis.

Visceral cancer

Vague low back pain can be the first manifestation of visceral cancer. The pain is not relieved with rest and can seem most intense at night. This nonmechanical back pain, which generally progresses relentlessly despite activity modifications and mild medication, should raise the suspicion of cancer.

The cancers that are associated with lumbar pain include those of the pancreas, duodenum, colon, uterus, cervix, and ovary. Because of the location of these organs, the diagnosis is usually made late, and many present with metastatic disease. In these cases, a careful evaluation to find the source of the patient's back pain may lead to earlier diagnosis and treatment. ■

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