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Overview

Low back pain (LBP), which is not a disease but a symptom, can be caused by known and unknown abnormalities and many specific diseases.

37.1 Definition

Low back pain (LBP), which is not a disease but a symptom, can be caused by known and unknown abnormalities and many specific diseases. LBP can be defined as the pain seen between the lower costal border and the gluteal fold and often accompanied by sciatica.

37.2 Epidemiology

LBP is the number one reason for disability. Since it is the most common reason for abstaining from work and physical activities, it creates a huge medical and economic burden on the patient and society. It is the second most common reason for consulting a doctor after respiratory infections. Its general prevalence is about 18%.

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Its 1-month prevalence is 30%, while its lifetime prevalence is approximately 40%. Peak incidence is reached between the ages of 40 and 69 and starts to decrease after that age. The possibility of LBP's activity restriction increases with advanced age. It is 20% more common in women than men. The risk of recurrence within 1 year after an LBP attack is approximately 25%. In the socio-economically disadvantaged group, the possibility of persistent pain and affecting daily life activities is higher compared to socio-economically advantageous counterparts. Studies conducted in the last decade have revealed that the lifetime incidence of LBP in adolescence is approximately 40%. The incidence is higher for girls than boys (39% vs. 35.0%). Its prevalence increases with age. It is reported as 1% for 7 years old, 6% for 10 years old, and 18% for 15 years old.

37.3 Etiology/Pathogenesis

LBP is a complex and multifactorial symptom that develops as a result of the relationship between many risk factors. Risk factors in LBP formation can be listed as structural deficiencies of musculoskeletal tissues; excessive static and dynamic loading, emotional state, and environmental and behavioral factors; beliefs and expectations about what can happen with low back pain in the future and whether it can be con-

trolled; social system; and social approach to the patient after LBP develops. The individual and variable response to musculoskeletal injury is a determining factor for LBP development. To explain the complexity of LBP, instead of the purely biomedical approach, the biopsychosocial approach can be applied as a framework.

Sources of pain in LBP encompass three different regions as specific lumbosacral, radicular, and reflected pain. Most frequently, no identifiable underlying pathology can be found at a rate of 90%. The rate of LBP seen with identifiable pathologies such as traumatic or osteoporotic fracture, stenosis, and lumbar disc hernia is approximately 5%. The rate of LBP that directly affects spinal structures such as neoplasia, metastasis, and infection is 1%. Approximately 2% of LBP comes from visceral organs that we call reflected pain.

Studies on the genetic origin of LBP have focused on genes that provide the formation of cartilage and bone structures and are accompanied by morphological signals in MRI. A genetic relationship has been identified between intervertebral disc height loss and disc herniation. Only a small part of genetic influences are caused by genes that affect disc degeneration. Therefore, it suggests that genetic variants of pain perception, signal transduction, psychological processes, and immune genes contribute to the heritability rate of chronic back pain. Genetic variability in pain transmission pathways may contribute to individual sensitivity to pain.

The pathophysiological mechanism underlying LBP has not been fully revealed. Pain in LBP can be caused by ligaments, facet joints, spinal nerve roots, vertebral periosteum, annulus fibrosus, and vascular structures. The basic sensation of the lumbar spinal structures is provided by the sinuvertebral nerve. The sinuvertebral nerve makes sensory innervation of the posterior longitudinal ligament, posterior annulus fibrosus, epidural vessels, posterior vertebral periosteum, and dural nerve root sleeve. The posterolateral part of the discs is innervated by the adjacent ventral primary rami and gray rami communicators near their junction with the ventral primary

rami. The lateral part of the discs is innervated by branches from the rami communicantes. The medial branch of the posterior primary ramus of the spinal nerve provides the innervation of the facet joint, the deep and superficial lumbar muscles, and the overlying skin and interspinous ligament. Repetitive movement patterns, strenuous activity, poor posture, and sports activities may cause microtrauma or stress on lumbar anatomical structures. Muscles and myotendinous junctions can be directly injured by a crushing force applied to the spine, and this will lead to lumbar strain. These forces can cause stress in the facet joint capsule, annular fissure, and/or ligament damage. Substance P, which causes lumbar pain syndrome as a result of these injuries, may provoke the neurohumoral cascade that will lead to the release of prostaglandins, leukotrienes, vasodilators. Pain affecting the patient is ultimately perceived by the central nervous system. In the central nervous system, LBP is shaped by all of the factors that make up the memory and perception of pain, such as genetically determined perception and conduction capacity, familial and social conditioning, work-related socioeconomic factors, and the individual's own experiences. All these factors should be considered when the patient comes with a complaint of LBP.

37.4 Classifications

LBP is divided into three categories according to the duration of symptoms. If the symptoms last less than 6 weeks, it can be defined as acute LBP; if it lasts for 6–12 weeks, it can be defined as subacute; and if it lasts longer than 12 weeks, it can be defined as chronic LBP.

LBP is divided into four main categories according to the diagnostic triage approach (Fig. 37.1). These categories are:

1. Nonspecific LBP
2. Radicular syndromes
3. Specific spinal disorders
4. Visceral disorders

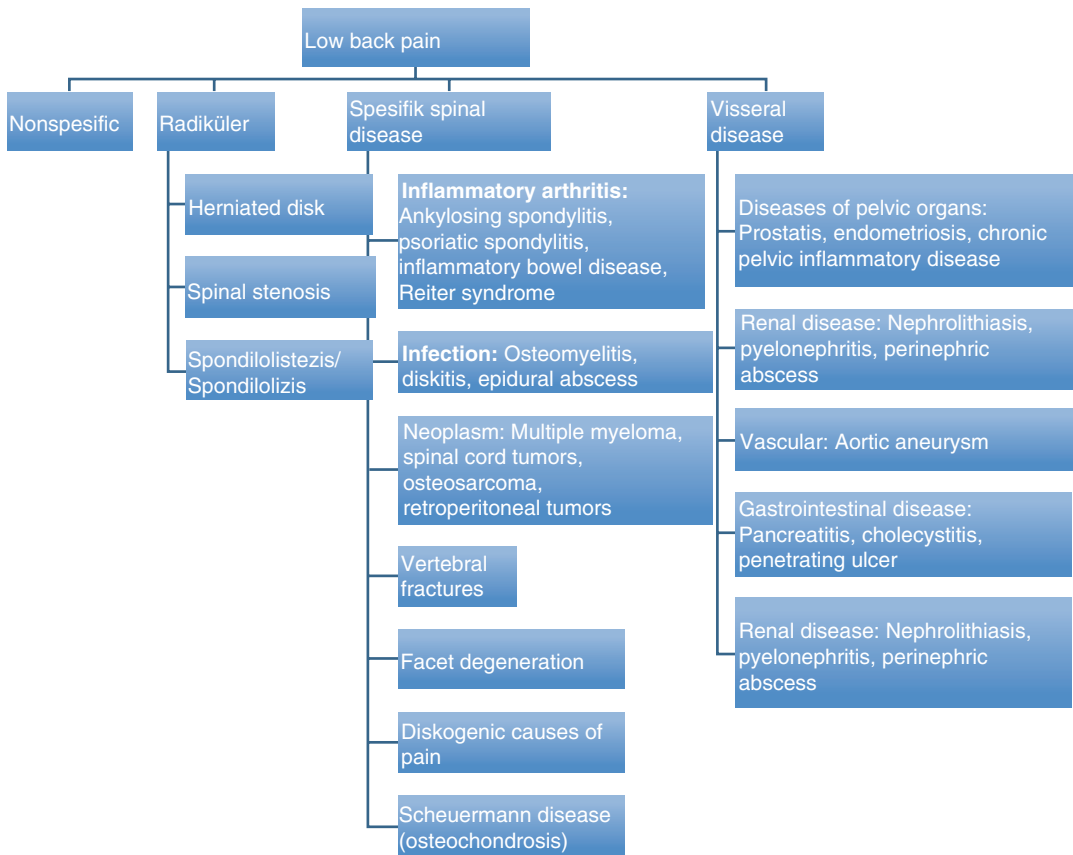


Fig. 37.1 Etiological classification of LBP

37.5 Diagnosis

37.5.1 Anamnesis

Since approximately 85% of the patients who apply for LBP in primary care are nonspecific LBP, it may not be possible to reveal the exact cause. Dividing the symptoms into three as acute, subacute, and chronic according to the duration of the symptoms helps us to determine the treatment. The location and spread of pain should be differentiated as axial or radicular. The level of pain should be determined by specific scales (visual analog scale or numerical rating scale score) as the current, worst, and average levels. The characteristics of pain should be questioned for burning, lancinating, aching, numbing, and

electric shock sensations. Questioning factors that increase and improve pain, such as sitting, walking, climbing stairs, and reaching, help to clarify the differential diagnosis. Documentation of a previous history of similar symptoms reveals whether the nature of the symptoms is intermittent or not. Previous diagnostic studies and patient’s response to previous treatments should be questioned in terms of subsequent treatments. The pain and functionality of the patient during work and daily life activities may affect the treatment. Besides, the anamnesis should include screening questions regarding structural symptoms that indicate a potentially progressive or unstable cause of pain such as cancer, infection, trauma, and neurological problems (red flags) (Table 37.1).

Table 37.1 Explanation of LBP according to the flag model

Red flags	<i>Indicates potential serious pathology</i>
1. Cancer-related signs	<ul style="list-style-type: none"> A. History of cancer B. Unexplained weight loss >10 kg within 6 months C. Age over 50 years or under 18 years old D. Failure to improve with therapy E. Pain persists for more than 4–6 weeks F. Night pain or pain at rest
2. Infection-related signs	<ul style="list-style-type: none"> A. Persistent fever B. History of intravenous drug abuse C. Severe pain D. Lumbar spine surgery within the last year E. Recent bacterial infection <ul style="list-style-type: none"> • Urinary tract infection or pyelonephritis • Cellulitis • Pneumonia • A wound in the spine region F. Immunocompromised states
3. Cauda equina-related signs	<ul style="list-style-type: none"> A. Urinary incontinence or retention B. Saddle anesthesia C. Anal sphincter tone decreased or fecal incontinence D. Bilateral lower extremity weakness or numbness E. Progressive neurologic deficit
4. Vertebral fracture-related signs	<ul style="list-style-type: none"> A. Prolonged use of corticosteroids B. Age greater than 70 years C. History of osteoporosis D. Mild trauma over the age of 50 years (or with osteoporosis) E. Recent significant trauma at any age
Yellow flags	<i>Include risk factors for chronicity and psychosocial issues</i>
	Expecting negative results from treatment, delayed return to work, anxiety, fear, negative thoughts about the recovery of pain, overreliance on passive treatments
Orange flags	<i>It includes psychiatric risk factors in the development of LBP</i>
	Depression, personality disorders
Blue flags	<i>Occupational problems</i>
	Believing that the job is too laborious and will likely result in further injury. Believing that the workplace supervisor and colleagues are not supportive
Black flags	<i>System or contextual obstacles</i>
	Heavy work with little opportunity to change tasks. Conflict with insurance personnel for the alleged injury

37.5.2 Physical Examination

Inspection: Inspection of the thoracolumbar spine gives information about posture and spine alignment (kyphosis, lordosis, scoliosis). Gait pattern gives information about etiologies; that is, antalgic gait indicates osteoarthritis, step-page gait indicates drop foot, duck-like gait indicates weak hip abductors, shear gait indicates spastic paralysis, and when the patient walks in an anterior trunk flexion posture, it indicates spinal stenosis. The skin should be evaluated in terms of scars, swelling, redness, trauma, or inflammation marks. While hair growth in the sacral area may indicate the underlying vertebral anomaly, dermatomal rashes indicate zoster infection.

Palpation: Although the tenderness localized in the spinous processes is nonspecific, it may indicate an abscess, an epidural tumor, or a vertebral compression fracture. Paraspinal tenderness may indicate facet syndrome. Copeman nodules can be palpated in the sacroiliac area.

Assessment of range of motion: Limitation of range of motion or development of pain with movement can guide us about the cause of pain. The normal range of motion is 90° forward flexion, 30° extension, 60° lateral rotation, and 25° lateral flexion. While the pain caused by extension or lateral rotation suggests facet arthropathy, pain caused by forward flexion suggests discogenic etiology.

Neurological examination: Lumbar and lower extremity motor and sensory examination gives information about the function of nerve roots and the level of pathology. Ankle dorsiflexion (L5), thumb extension (L5–S1), knee flexion (L5–S1), hip flexion (L2–L4), and knee extension (L2–L4) constitute the basic muscle strength examination. While the patellar tendon reflex shows the functional integrity of the L2, L3, and L4 roots, the Achilles tendon reflex shows the functional integrity of S1. Reflexes may not be obtained in people over 60 years old.

Straight leg raising test: While the patient is in the supine position, the examiner lifts the affected leg by holding the heel without bending the knee.

The occurrence or worsening of radicular symptoms between 30 and 70° indicates a positive test. The test suggests an L5–S1 lesion. Pain localized to the back of the thigh during the maneuver suggests hamstring tension.

Lasègue’s test: It is a modification of the SLR test. When the pain occurs or worsens during the SLR test, the leg is lowered 5–10° and the ankle is brought to dorsiflexion. The occurrence of pain indicates a positive test.

Femoral stretching test: While the patient is in the prone position, the leg is slightly lifted and the knee is flexed. The development of pain in the anterior aspect of the thigh suggests L2–L4 radiculopathy.

Cross straight leg raising test: It is the occurrence or worsening of radicular symptoms in opposite leg while performing a straight leg raising test. It is more specific than SLR but not as sensitive.

Bragard sign: During the SLR test when pain is triggered, examiner brings the ankle in dorsiflexion position, resulting in worsening of symptoms.

Patrick test (FABER test): While the patient is in supine position, examiner lifts the affected leg by holding the heel, then the knee is brought to flexion position, the hip is externally rotated, and the ankle of affected leg is placed on the opposite knee. Pain in the groin during this maneuver suggests hip pathology, and pain in the hip and waist suggests sacroiliac joint pathology.

Nonphysiological back pain: Low back pain with no organic cause, often related to secondary gains or psychosocial problems. Waddell identified five signs to differentiate nonphysiological pain; the presence of three suggests nonphysiological back pain (Table 37.2).

37.5.3 Diagnostic Tests

Further diagnostic studies are not required in nonspecific LBP and radicular syndromes. Diagnostic studies are required when specific spinal pathology or visceral disorders are sus-

Table 37.2 Waddell’s nonorganic signs

Tenderness	It is not related to a specific skeletal or neuromuscular pathology; often superficial and/or nonanatomic
Simulation tests	These tests give the patient the impression of a specific examination, even though it has not been performed
Distraction tests	Routinely demonstrated positive physical sign is checked again while the patient is distracted; if the symptom disappears when the patient is distracted, an inorganic component may be present
Regional disturbances	Dysfunction involving a large area of body parts (e.g., sensory, motor) that cannot be explained anatomically; must be distinguished from multiple nerve root involvement
Overreaction	It may be in the form of disproportionate verbalization, facial expression, muscle tension and tremors, collapse, or sweating; the decision must be made carefully, and the supervisor’s own emotional response must be minimized

pected at initial clinical evaluation. In diagnostic imaging methods, the first choice is two-way direct graphs. It gives information about diseases such as osteoporotic fractures, benign and malignant tumors, osteomyelitis, and spondyloarthritis. If there is a suspected bony lesion on direct radiography, we can have detailed information about the pathology with computerized tomography (CT). With CT, we can evaluate the disc, ligaments, adipose tissue, and nerve roots. CT provides valuable information in terms of surgical planning, especially in patients with trauma, spinal **deformity**, and stenosis. Since radiation exposure is high in CT, it should be used when it is the only option that will provide a diagnosis. Pathology can be better characterized by MRI when soft-tissue abnormalities, disc pathologies, myelopathy, infection, tumors, and stenosis are suspected. The diagnostic value of laboratory studies is low, except for patients with red flag findings. For patients with suspected malignancy and infection, complete blood cell count, C-reactive protein (CRP), and sedimentation rates are indicated.

37.5.4 Extrinsic Causes of LBP

Intrinsic and extrinsic factors could cause LBP. The former are due to traumatic, pathologic, or degenerative conditions of the lumbar spine. The latter are caused by visceral diseases that produce radiating pain to the spine. Notwithstanding degenerative disc disease is the most common cause of LBP, other conditions are elusive in diagnosis and resulting in a treatment failure. Degenerative disc disease could be present in patients of all ages, and in case of a clear-cut diagnosis, it is attributed as the primary cause of LBP. The clinician needs to focus the attention on other underlying pathologies to rule out extrinsic causes of LBP.

37.5.5 Vascular Disease

The most frequent vascular disease that produces LBP or symptoms resembling sciatica is the abdominal aortic aneurysm (Fig. 37.1).

This condition leads to progressive and irreversible dilatation of the aortic wall. It is usually provoked by atherosclerosis and determines the flattening of the muscular and elastic fibers of the aorta. The systolic pressure progressively increases the artery diameter due to the reduction of elasticity of the aortic wall. It could be asymptomatic in the early stage of the disease, even if a persistent deep-seated lumbar pain unrelated to physical activity could be present. One of the earliest symptoms of this situation is the LBP. In case of increased aortic diameter, the artery could irritate the periosteum and the intervertebral disc with every systole, causing LBP. In the late stages, the aortic wall could tear, causing extensive bleeding and death in 90% of cases. Moreover, in case of significant dilatation, intra-aortic thrombosis may occur, with consequent stroke due to embolization of atherosclerotic and thrombotic debris.

Another vascular disease that causes LBP is the insufficiency of the superior gluteal artery. This condition may produce a buttock pain with a claudicant character, aggravated by walking and relieved by standing still. A sciatic pattern of the pain may be present. However, bending, lifting,

and other activities that involve spine movements do not exacerbate the pain. The intermittent claudication (with intermittent calf pain) caused by peripheral vascular deficiency could simulate sciatic pain. In this condition, the pattern is specific because walking increases pain while patients are relieved by standing still. These symptoms are similar to pure spinal stenosis claudication, but in this case, the pain is not relieved by standing still. In the case of vascular LBP, the pain is present during the day, and there is no muscular contracture.

37.5.6 Viscerogenic LBP

Viscerogenic back pain may be derived from disorders of the bowel, liver, kidneys, pelvic viscera, lesions of the lesser sac, and retroperitoneal tumors. Otherwise, LBP is usually accompanied by other symptoms in case of visceral disease. The most important difference with intrinsic causes of LBP is that the pain is not exacerbated by activity, and it is not relieved by rest. The Luschka nerve innervates the articular apophyses of L1 and L2. The pain is due to overloading of this joint. This pain reflects the topography of the roots L1–L2 (the lateral region of the lumbar spine, upper buttock, and groin area). For this reason, this pain is often attributed to appendicitis or abdominal conditions. One of the identifying signs of Luschka nerve irritation is the “pincé roulé sign.” Picking up the skin (skin and subcutis of the gluteal or inguinal region) and moving it under the finger, the patient experiences significant pain.

37.5.7 Kidney Diseases

Ureteral stones and pyelonephritis could cause LBP on the affected side.

37.5.8 Liver Diseases

The hepatosplenomegaly in cirrhosis patients or toxic hepatopathies could increase the Glisson’s capsule tension. Due to the innervation of this

capsule, a radiating continuous and persistent pain to the right flank could be referred by the patient. Moreover, cholelithiasis and cholecystitis could present the same pain pattern.

37.5.9 Intestinal Diseases

Transverse colon and colic flexure diseases (colitis, tumors, and malabsorption) could produce LBP.

37.5.10 Gynecological Diseases

Polycystic ovary syndrome (PCOS), endometriosis, retroverted uterus, and gynecological tumors could cause LBP. Uterus and ovaries are attached to the suspensory ligaments. In case of irritation of these structures, radiating pain to the spine could be present.

37.5.11 Psychogenic LBP

Patients that suffer from LBP or cervical pain nonresponding to conservative treatment and NSAIDs are frequent. The lumbar and the cervical spine are the most frequent contracture sites in case of psychological problems. Pure psychogenic back pain is rarely seen in clinical practice. Instead, diffuse and nonmetameric pain is more commonly observed in depressed patients. The clinician must learn to recognize the presence of an emotional breakdown, and it is essential not to forget that an underlying organic disease could be present.

37.6 Treatment

Since biopsychosocial factors contributing to LBP are prominent, the treatment should be viewed from the same perspective. With this approach, treatment should include both physical therapy and other dimensions (psychological, social, or occupational). Patients should be taught to manage their condition on their own. The patient should be informed about the natural

course and prognosis of the disease, importance of staying active, and multimode self-care in intermittent symptoms. Unnecessary and complicated treatments should be avoided by applying a step-by-step treatment approach. Relieving pain and preserving function are the main goals of treatment. Acute LBP improves by 90% in the first 6 weeks.

In chronic LBP, self-management and physical therapy should be recommended before pharmacological treatment. Supervised exercise programs are effective in preventing LBP and chronic LBP.

Physical therapy and rehabilitation can also be used together with other methods to increase functionality and pain management. Stretching exercises are effective in reducing pain, and strengthening exercises are effective in increasing functionality. The effectiveness of modalities such as waist school, superficial cold or hot application, massage, and TENS has not been demonstrated by randomized controlled trials.

Pharmacologic treatment: NSAIDs are effective in short-term pain treatment in both acute and chronic pain. Acetaminophen up to 4 g per day has been found to be as effective as NSAIDs in acute pain, but its effectiveness is lower in chronic pain. It is recommended that NSAIDs should be used for the shortest duration—the lowest dose due to side effects. Muscle relaxants are also effective in acute low back pain. Opioid analgesics should be reserved for severe pain that cannot be controlled with the aforementioned agents. Tricyclic antidepressants have also been shown to be effective in chronic LBP. It is particularly effective in chronic LBP patients with fibromyalgia. Antiepileptics can also be used in the treatment of chronic LBP. Gabapentin has been shown to have analgesic efficacy in chronic LBP accompanied by radicular pain.

Psychosocial approaches are suitable for patients with acute pain who are candidates for chronicity with a yellow flag sign as well as patients with chronic pain. Behavioral cognitive therapy and biofeedback are examples of psychosocial approaches.

Acupuncture, one of the complementary medicine approaches, has been found to be effective

in reducing pain and increasing functionality from the treatment of chronic low back pain.

Minimally invasive approaches such as facet injection, medial branch nerve block, RF neurotomy, sacroiliac joint injections, and epidural steroid injections can be used in patients who do not respond to multidisciplinary conservative treatment methods.

37.6.1 Surgical Methods

Surgical treatment is not recommended for non-specific LBP unless the underlying anatomical cause is revealed. Surgery is applied as the last-step treatment depending on the cause of the specific pathology. Surgery is indicated in some patients with red flag symptoms, such as cauda equina syndrome. In cauda equina syndrome, decompressive surgery is required within 48 h to preserve neurological functions.

When disc herniation is diagnosed, disc excision can be performed using methods such as microdiscectomy, percutaneous suction discectomy, and percutaneous laser discectomy. Spinal decompression and fusion surgery can be performed when there are symptoms of spinal instability and stenosis.

Take-Home Message

- It is the most common cause of avoiding physical activity and work life.
- It is also very common in the adolescent period.
- In the last decade, in LBP etiology, the biopsychosocial model which explains the etiology more comprehensively has been emphasized instead of the simple injury model.
- Nonspecific LBP is the most common type with a rate of 85–95%.
- Red flags are symptoms that indicate infection, fracture, malignancy, inflammatory disease, and neurological disease by causing LBP.

- If patients presenting with LBP have red flag findings, further investigation is required.
- Acute LBP resolves spontaneously in 80% in 2 weeks.
- The importance of keeping the patient active during the treatment process should be emphasized.
- Unnecessary treatments can be avoided by applying a step-by-step treatment approach.
- The treatment should be specified to the patient with a multidisciplinary approach by evaluating pharmacological treatment, physical therapy and rehabilitation, psychological treatment, and social aspects.

Summary

LBP is the most common cause of disability globally. The burden on the individual and society continues to increase. Therefore, it is a public health problem. In most patients, LBP is short-term, and specific nociceptive causes cannot be revealed. For this reason, it is called non-specific. The persistence of underlying physical, psychological, and social factors increases the likelihood of chronicity. Imaging and laboratory examination may be required, based on history and physical examination, and red flag findings. NSAIDs and myorelaxants are recommended as first-line treatment in pharmacological treatment. If there is no response to treatment, a minimum dose of opioids may be prescribed. Physical therapy and rehabilitation treatment should be the other dimension of the treatment. During the treatment process, it is aimed to relieve the pain, prevent it from becoming chronic, and return to social life as soon as possible.

Questions

Multiple correct answers are possible. Answers available in the book back matter.

1. A 30-year-old man feels pain in his lower back while lifting a heavy object at work 3 days ago. Because of this pain, he cannot go to work. He states that this pain is for the first time. On physical examination, there is tenderness in the lumbar paraspinal muscles with palpation. Neurological examination is normal. Which of the following should not be applied?
 - (a) Range-of-motion exercises
 - (b) Lumbar X-ray
 - (c) NSAID
 - (d) Reassurance
 - (e) Suggesting to remain active in daily life
2. Which of the following is the probability that acute low back pain will improve within 6 weeks?
 - (a) 50%
 - (b) 60%
 - (c) 70%
 - (d) 80%
 - (e) 90%
3. Which of the following nerves innervates the posterior annulus fibrosus?
 - (a) Dorsal ramus ventral branch of spinal nerves
 - (b) Dorsal ramus lateral branch of spinal nerves
 - (c) Sinuvertebral nerve
 - (d) Gray ramus communicans
 - (e) Ventral ramus of spinal nerves
4. A 40-year-old male patient applies to your clinic with complaints of back pain and both leg pain for 3 days. Which of the following physical examination findings suggests that the complaint is associated with L5–S1 radiculopathy?
 - (a) Patrick test
 - (b) Gaenslen test
 - (c) Straight leg lift test
 - (d) Femoral stretching test
 - (e) Hoffmann's test
5. Which of the following findings does not require a diagnostic workup in the patient who applied to your clinic with low back pain complaint?
 - (a) Pain persists for more than 4–6 weeks
 - (b) Immunocompromised states
 - (c) Bilateral lower extremity weakness
 - (d) Prolonged use of corticosteroids
 - (e) Tenderness to light touch

Further Reading

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