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Low back pain – a review

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Abstract
Low back pain (LBP) is a common condition affecting many individuals worldwide. Furthermore, it represents a significant economic challenge for healthcare systems due to its substantial associated costs. The etiology of LBP is complex but, in most cases, is not caused by serious underlying diseases. Physical examination remains the cornerstone of diagnosis, while additional tests, including imaging, are determined based on the clinical context. Treatment involves a combination of non-pharmacological, pharmacological, and invasive interventions. Despite numerous attempts to prevent LBP, only a few methods have been scientifically proven to be effective.
The aim of this review was to provide a comprehensive summary of evidence-based information and approaches regarding the pathogenesis, treatment, and prevention of LBP. The literature reviewed was sourced from PubMed and Google Scholar Rusing the key words "low back pain" combined with terms such as "pathogenesis," "diagnostics," "imaging diagnostics," "treatment," and "prevention."

Keywords: Low back pain, pathogenesis, diagnostics, imaging diagnostics, treatment, prevention

Introduction

Low back pain (LBP) is defined as pain located in the area extending from the lowest rib to the gluteal crease, with or without radiation to the legs (1,2).

Low back pain is one of the most common conditions in the world. It affects people of all ages (1). Up to 1 in 5 doctor visits in the United States is due to this type of pain. In addition, low back pain is a significant burden on social budgets. In 2016, Canada and the United States together spent more than $134.5 billion on the diagnosis and treatment of back and neck pain (3).

Materials and Methods

The aim of this review was to analyze the current knowledge on the pathophysiology, diagnosis, treatment, and prevention of low back pain. The literature search was conducted using PubMed and Google Scholar platforms. The key words used included: "low back pain" combined with terms such as "pathogenesis," "diagnostics," "imaging diagnostics," "treatment," and "prevention." The collected materials were used to present relevant information regarding low back pain. The review included studies such as review articles, bibliographic studies, cohort studies, and meta-analyses.

Epidemiology

The annual incidence of chronic low back pain is estimated at 15 - 45%, with a point incidence of approximately 30% (1). Data on the prevalence of pain syndromes by gender indicate that the prevalence increases with age in women, who experience more recurrences. General risk factors for low back pain include age, heavy physical work, obesity, smoking, and psychological factors. Psychosocial factors play a key role in the transition from acute to chronic pain, acting as so-called “yellow flags.” These include anxiety, financial difficulties, depression, job dissatisfaction, family problems, or stress (4,5,6).

Etiology and classification

Low back pain (LBP) is a complex phenomenon. One major classification distinguishes between musculoskeletal pain - known as nonspecific pain - and neurogenic pain, known as specific pain (7). The most common type is nonspecific pain, accounting for 80 - 90% of cases (8). This form of pain is characterized by the absence of specific abnormalities detectable on imaging studies that could confirm its cause. Identified contributing factors to nonspecific LBP include dysfunction, increased tension, and degeneration of the tendons and paraspinal muscles, as well as abnormalities in spinal alignment and biomechanics (2). When the pain-causing factor can be identified and confirmed by diagnostic tests, the pain is classified as specific pain. About 5% of such pain is classified as neurogenic pain, which is caused by compression of a nerve root. The most common cause of this type of pain is discopathy, although it can also result from degenerative changes in the spine, neoplastic processes, fractures, or spinal stenosis . Other causes of specific back pain include inflammatory pain associated with seronegative spondylitis, epidural abscesses in the spinal canal, pathologic fractures, and osteomyelitis. Although these causes are much rarer, they require prompt diagnosis and targeted treatment (9,10,11)

The basic classification based on pain duration includes: acute (lasting less than 4 weeks), subacute (4 to 12 weeks), and chronic (lasting more than 12 weeks).
These pathophysiological and temporal criteria provide a basic clinical classification that allows for accurate diagnosis and treatment of low back pain (12).

Low back pain diagnostics

The diagnostic process for LBP primarily includes a detailed medical interview, physical examination, and consideration of additional advanced diagnostic tests (13).
The interview with the patient differs slightly in cases of acute and chronic LBP. In the case of acute pain, symptoms last less than 6 weeks. During the interview, it is important to determine the onset, duration, and nature of the pain. It is important to note whether the pain improves or worsens with rest, occurs during sleep, or interferes with daily activities. It is also useful to ask about the presence of significant stressors in the recent period (2, 9).
The key element of the interview is to assess the characteristics of the pain, which can help in the differential diagnosis. Pain described as stabbing, sharp, or burning often has a radicular origin. Information provided by the patient regarding body position and pain intensity can also be helpful. In most patients, low back pain is worsened by sitting. However, in cases of intervertebral arthritis, spinal stenosis, and sacroiliac joint dysfunction, standing may worsen the pain, whereas sitting may provide relief. Persistent pain, regardless of body position, may indicate the presence of a neoplastic process in a given area (14, 15).
An important part of any patient interview is to rule out so-called "red flags." The presence of these red flags requires the initiation of specific and often urgent treatment. However, they are not common causes, accounting for about 1% of the type of pain discussed. These symptoms should be assessed at each new visit, as well as in the event of a worsening of the current condition or the appearance of new symptoms. "Red flags" include: history of cancer, trauma, infections, and neurological deficits (9, 10).
A history of cancer is a significant risk factor for metastasis to the bones of the spine. The most common cancers that metastasize include: breast cancer, lung cancer, and prostate cancer. Other symptoms, such as recent weight loss, severe pain, and lack of relief with body position, should be noted (13). Recent infection, immunosuppression, vascular catheters, spinal injections, fever may indicate spinal infection (6).
People reporting a trauma, geriatric patients at risk of osteoporosis, and those taking chronic glucocorticosteroids should be evaluated for vertebral fractures (16).
Observing neurological disorders resulting from pressure on individual nerves or their roots or pressure on multiple roots also requires urgent and detailed diagnostics. Cauda equina syndrome will cause, among other things, sphincter dysfunction, decreased sensation and muscle strength (6, 17).
When taking a medical history from a patient with chronic pain, in addition to the aspects mentioned above and assessing potential red flags, it is important to focus on psychosocial factors that increase the risk of the pain becoming chronic. These factors include anxiety, financial difficulties, depression, job dissatisfaction, family problems, or stress (9). Specific questionnaires such as the STarT Back Screening Tool (18) or the Örebro Musculoskeletal Pain Screening Questionnaire (19) can be used to assess these.

After taking the history, the next step is to conduct a physical examination.

The examination of a patient with lower back pain includes not only an assessment of the patient's general condition, gait, and visible deformities, but also a more detailed neurological examination. The diagnostic process includes an assessment of superficial sensation, motor function, including range of motion of the spine and lower extremity joints, and muscle strength. The spinous processes of the spine should be palpated. Tenderness in this area may indicate inflammation, an abscess, or a compression fracture (2).

The physical examination includes several specific tests to identify potential disorders contributing to lower back pain. One such test is the Patrick test, which evaluates the hip and sacroiliac joints, their pathology has been associated with lower back pain. The test involves the patient lying on their back, the examiner passively flexing, abducting, and externally rotating the hip. Tenderness in the back suggests sacroiliac joint pathology, and in the groin, hip joint pathology (20).

Another important test is the straight leg raise (SLR). This test helps determine whether the pain is due to compression of the lumbar nerve roots or the hamstrings. The patient lies on their back while the examiner raises the leg with the knee straight, flexing the hip at 70° to 90°. This test stretches the lumbar nerve roots, and a positive result is when the patient feels radicular pain radiating from the lower back or hip down to the ankle. If the pain remains localized to the back of the thigh, it is likely due to a hamstring strain (6).

Another test is the Gaenslen test. With the patient lying on his back, one hip is maximally flexed and the other is straight, which puts a strain on both sacroiliac joints. The test is considered positive if this maneuver reproduces the pain associated with the sacroiliac joint. It confirms the existence of pathology associated with the sacroiliac joints (21).

In the differential diagnosis of lower back pain, it is important not to ignore pain of extravertebral origin. Several diseases with different causes can lead to pain in this area. The most important diseases belonging to the indicated groups include (22):

Vascular diseases: abdominal aortic aneurysm, acute aortic syndrome, vascular fistulas, epidural hematoma.

Digestive system diseases: gallstones, cholecystitis, pancreatitis.

Gynecological and urological diseases: endometriosis, urinary tract infections, urolithiasis, prostatitis, renal ischemia.

Imaging is recommended only when indicated. The review authors agree that in cases of typical acute pain, without red flags or neurological symptoms, imaging should not be performed (23). Among the initial imaging studies, AP and lateral lumbar spine radiographs are usually performed (24). In cases of red flags or lack of response to previous treatment, magnetic resonance imaging (MRI) is generally preferred over computed tomography (CT). MRI is much more sensitive and does not expose the patient to ionizing radiation. MRI is most commonly performed without contrast enhancement. Additionally, depending on the clinical suspicion, gadolinium-enhanced MRI may be performed, which is helpful in diagnosing patients who have had previous surgery. If MRI is unavailable, CT is recommended (10, 25).

Imaging raises many concerns about clear indications. Interestingly, both overuse and underuse of imaging have been described (26). In some cases, imaging reveals degenerative changes that are not responsible for the pain symptoms. Such changes are common in the population and do not cause clinical symptoms. This emphasizes the importance of correlating the patient's clinical condition with imaging findings (27).
Laboratory tests are not recommended for the general patient population, except when a specific cause of pain is suspected. In cases where infection or malignancy is suspected, tests such as a complete blood count (CBC), CRP (C-reactive protein), and ESR (erythrocyte sedimentation rate) are recommended (2).
Additionally, there is a possibility of performing other tests, such as electromyography (EMG). This test helps to distinguish between the existence of chronic and acute radiculopathy, and to confirm whether radiological changes are responsible for the symptoms experienced (17).

Treatment

Treating lower back pain is a complex problem, with notable differences in the treatment of acute and chronic pain. Each treatment approach requires a combination of interventions. These include patient education, pharmacological treatment, physical therapy, and psychotherapy (26).

Acute pain treatment:

Treatment should begin with a conversation with the patient to reassure them that in the vast majority of cases, acute pain is not caused by serious illnesses. Patients should be encouraged to remain active, avoid prolonged bed rest, and return to normal physical activity as soon as possible (2). If no improvement is seen after a month, the treatment plan should be reviewed and reassessed for red flags (9).
Pharmacological treatment includes nonsteroidal anti-inflammatory drugs (NSAIDs), such as ibuprofen, diclofenac, and naproxen, as well as COX-2 inhibitors. These drugs are the first-line therapy. Low-potency opioids, such as tramadol, can also be considered, especially in patients with severe pain (24). In addition, some authors recommend the use of muscle relaxants, such as baclofen, tizanidine, methocarbamol, or thiocolchicoside (11). Paracetamol is considered an alternative to NSAIDs, although its effectiveness is less well documented. It is important to remember the side effects of all drug groups (28). The most important include (13):
NSAIDs affect kidney function, cardiovascular system, and gastrointestinal tract
Myorelaxants: effects on the central nervous system
Opioids: addiction
Physiotherapy Interventions cointanis techniques aimed at strengthening the paraspinal muscles and spinal manipulation are commonly recommended. However, no significant benefits have been demonstrated for these interventions in the acute phase of low back pain (29).

Chronic pain treatment:

When treating chronic low back pain, reassessment for red flags should be performed. Treatment primarily focuses on progressive physical activity and rehabilitation techniques, although these are not always described in detail (4).

Massage and soft tissue mobilization are recommended in most guidelines, but only as part of a multimodal treatment approach that includes active rehabilitation (30).
Psychotherapy is an essential part of treatment. Cognitive behavioral therapy (CBT) and stress reduction strategies are considered first-line interventions. There is evidence to show that CBT reduces pain intensity (31, 32).
Nonsteroidal anti-inflammatory drugs (NSAIDs): Still a mainstay treatment option, but should be used with caution due to potential side effects. Low-dose opioids: These are considered second-line treatment and may be used selectively in patients unresponsive to other therapies. Muscle relaxants: Some authors recommend the use of muscle relaxants such as baclofen or tizanidine in selected patients. Antidepressants: There is data showing the effectiveness of tricyclic antidepressants (TCAs). In addition, serotonin and norepinephrine reuptake inhibitors (SNRIs) are also used. Duloxetine is usually a better-tolerated drug. Among the side effects of these groups of drugs, attention is drawn to anticholinergic activity and drowsiness in TCAs and to headaches and dizziness in SNRIs (4, 11, 13).
Anticonvulsants: The role of medications such as pregabalin remains uncertain due to conflicting evidence regarding their efficacy in treating chronic pain. Another drug studied for use in therapy was topiramate, which provided satisfactory analgesia in some patients (33).
Topical pain relievers: Topical agents, including lidocaine patches, capsaicin, and NSAIDs, can provide local pain relief. However, their role in treating chronic pain is not well defined, and they are generally recommended for short-term use (34, 35).
Epidural injections: Because of the risks involved and the limited evidence supporting their effectiveness, epidural injections are not recommended as first-line treatment. They may be beneficial for carefully selected patients, such as those with pain originating in the sacroiliac joints (4, 12).
Surgical treatment options: The choice of the type of surgical intervention depends on the specific clinical case. Nonradicular Pain: For nonradicular lower back pain, spinal fusion surgery does not appear to be more effective than conservative treatment. Therefore, nonsurgical approaches are often prioritized. Neurological deficits: In the presence of neurological deficits, decompression surgery is usually recommended to reduce pressure on the affected neural structures (36). Radicular Pain: Decompression surgery may also be considered for radicular pain caused by conditions such as a herniated disc or spinal stenosis, especially when conservative treatments do not provide relief. Although surgery may provide short-term benefits, it exposes patients to potential complications. Furthermore, the long-term benefits of surgical intervention (>1 year) tend to decrease over time, making patient selection and careful counseling crucial (37).

Prevention:

Despite the prevalence of back pain and its significant financial and societal costs, most research has focused on secondary rather than primary treatment and prevention (38).
The methods of lower back pain prevention include: exercise, exercise and education, education, back belt, shoe insoles, ergonomic interventions at workplace (4). Available meta-analyses have shown that exercise is the most effective way to prevent back pain.

A recommended programme of 2 - 3 sessions per week, combining strengthening exercises with aerobic training and/or stretching, will significantly reduce the risk of back pain and related disability (39). Other interventions, such as education alone, back belts, shoe inserts, and ergonomic programs, may not be effective. They show limited or no significant effect on preventing low back pain. Interestingly, exercise intensity plays a key role in achieving preventive benefits (39, 40).

Conclusions:
Despite its widespread prevalence worldwide and the significant costs associated with it, back pain remains a topic requiring further research. Most diagnostic guidelines are consistent and leave little room for ambiguity. Strict adherence to diagnostic imaging indications is essential, which can protect patients from unnecessary testing. Unjustified imaging can expose patients to ionizing radiation and cause unnecessary stress without providing information that influences the diagnostic or therapeutic process.
Recommendations for treatment and prevention are less clear. As highlighted, there is much uncertainty, particularly regarding the use of medications beyond painkillers for the treatment of low back pain. Based on the reviewed literature, physicians should prioritize adherence to current guidelines, especially those that emphasize nonpharmacological approaches, which are currently the mainstay of treatment for chronic pain syndromes.
Additionally, attention should be paid to effective methods of preventing back pain, as they can bring significant results.

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