

Nonsurgical Management of Acute and Chronic Low Back Pain

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None of the following authors or the departments with which they are affiliated has received anything of value from or owns stock in a commercial company or institution related directly or indirectly to the subject of this article: Dr. Shen, Mr. Samartzis, and Dr. Andersson.

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J Am Acad Orthop Surg 2006;14:477-487

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Abstract

A variety of nonsurgical treatment alternatives exists for acute and chronic low back pain. Patients should receive appropriate education about the favorable natural history of low back pain, basic body mechanics, and methods (eg, exercises, activity modification, behavioral modification) that can reduce symptoms. Nonprescription medication is efficacious for mild to moderate pain. Nonsteroidal anti-inflammatory drugs, alone or in combination with muscle relaxants, relieve pain and improve overall symptoms of acute low back pain. Exercise therapy has limited value for acute low back pain, but strong evidence supports exercise therapy in the management of chronic low back pain. Moderately strong evidence supports the use of manipulation in acute back pain. Evidence is weak for the use of epidural corticosteroid injections in patients with acute low back pain, strong for short-term relief of chronic low back pain, and limited for long-term relief of chronic low back pain. The use of facet injections in the management of acute low back pain is not supported by evidence, nor is the effectiveness of orthoses, traction, magnets, or acupuncture. Trigger point injections are not indicated for nonspecific acute or chronic low back pain, and sacroiliac joint injections are not indicated in the routine management of low back pain. Conflicting evidence exists regarding the use of transcutaneous electrical nerve stimulation.

Low back pain is a common occurrence in the general population, affecting both sexes and all age groups, ethnic groups, and socioeconomic classes.^{1,2} Most patients recover quickly and without residual loss of function; however, recurrence is part of the natural history.³⁻⁵ Furthermore, chronic symptoms develop in 5% to 10% of patients.² As a result, the cost to the individual and to society is enormous.

Treatment of low back pain is

challenging. A variety of therapeutic interventions is available, but no single modality appears to be superior, and evaluations vary depending on the cause of pain and on individual, social, and occupational factors.^{6,7} Scientific evidence supports the use of some nonsurgical treatment alternatives in patients with acute and chronic low back pain.

In reviewing these nonsurgical treatment alternatives, we present evidence-based information; how-

Table 1
Low Back Pain Red Flags That Contraindicate Nonsurgical Treatment

Possible Condition	History	Physical Examination
Fracture	Major trauma Minor trauma (older patient)	Kyphosis
Tumor	Age <15 or >50 years Known cancer Unexplained weight loss Night pain	—
Infection	Recent fever or chills Recent bacterial infection (urinary tract infection) Intravenous drug use Immune suppression Unrelenting pain	Fever
Cauda Equina Syndrome	Saddle numbness Urinary retention, incontinence Severe (progressive) lower extremity neurologic deficit	Weak anal sphincter Perianal sensory loss Flaccid motor weakness Hyporeflexia

ever, this paper is not the result of a formal meta-analysis or systematic review of the literature. Based on individual patient condition, personal needs and preferences, and the physician’s experience, different treatment alternatives may be appropriate. This review does not represent standards of care, but rather evidence-based information about alternatives of care. Recent semi-invasive interventions, such as heat ablation, percutaneous discectomy, and pain modulation, are not included.

Etiologies of Low Back Pain

The nonsurgical treatment of low back pain should be based on the different etiologic possibilities. In most patients, no specific pathoanatomic underlying cause is identifiable. When the pathology is known, treatment can often be specifically directed at the cause. Usually, however, treatment is directed to reducing pain and increasing function irrespective of cause. A subset of low back conditions involves disorders

of the cauda equina and/or lumbar nerve roots. They are distinguished from the more common type of back pain by the presence of radicular symptoms with or without neurologic changes.

The treatment of axial low back pain does not specifically include radicular pain. Symptoms and presentations usually develop subsequent to an accident or incident, but often the onset is insidious. The patient presents with pain that typically increases with activity and decreases with rest. Imaging studies demonstrate either no abnormalities or varying degrees of degenerative changes, which often are those that are expected as part of the normal aging process.

Contraindications to nonsurgical treatment of low back pain, although few, are important. These patients can usually be identified from the history and physical examination. The telling signs are often referred to as red flags (Table 1); their presence requires consideration for further work-up. Also uncommon, but equally important, is a nonorganic etiology. The occasional pa-

tient who presents with nonorganic history and/or physical signs also requires special attention⁸ (Table 2).

Differentiation between acute and chronic low back pain is essential because the natural history, treatment, and prognosis will differ. Acute low back pain is often defined as low back pain lasting up to 12 weeks, while chronic low back pain is variably defined as low back pain lasting longer than 12 weeks, as frequently recurring low back pain, or as pain lasting beyond the normal healing period for a low back injury. In these chronic cases, changes in the central neuromodulation of pain are part of the pathophysiology.⁹

Epidemiology and Natural History

Low back pain is a significant public health problem affecting all age groups and socioeconomic classes. Understanding the natural history is helpful in developing appropriate management and providing correct information to the patient. The patient should understand the prognosis and the purpose of each treatment recommended.

More than 70% of people in developed countries will experience low back pain some time in their lives;¹⁰ the annual incidence ranges from 15% to 45%.¹ Back pain appears to occur with equal frequency in men and women. Although low back pain occurs in all age groups, those between the ages of 35 and 55 years are most commonly affected. Health care service utilization is considerably skewed; fewer than 25% of the cases account for more than 75% of the cost. Back injuries occur in some 2% of the work force every year, resulting in workers’ compensation costs of more than \$20 billion.^{1,11} In 1998, the total health care expenditures incurred by patients with back pain in the United States reached \$90.7 billion.¹²

Recurrence is part of the natural history of low back pain, occurring

Table 2**Nonorganic Physical Signs That Indicate Illness Behavior***

Symptoms or Signs	Physical Disease/Normal Behavior	Abnormal Illness Behavior
Symptoms		
Pain	Anatomic distribution	Whole leg pain Tailbone pain
Numbness	Dermatomal	Whole leg numbness
Weakness	Myotomal	Whole leg giving way
Time pattern	Varies with time and activity	Never free of pain
Response to treatment	Variable benefit	Intolerance to treatments; emergency admissions to hospital
Signs		
Tenderness	Anatomic distribution	Superficial; widespread nonanatomic distribution
Axial loading	No lumbar pain	Lumbar pain
Simulated rotation	No lumbar pain	Lumbar pain
Straight-leg raising	Unchanged on distraction	Improves with distraction
Sensory	Dermatomal	Regional
Motor	Myotomal	Regional, jerky, giving way

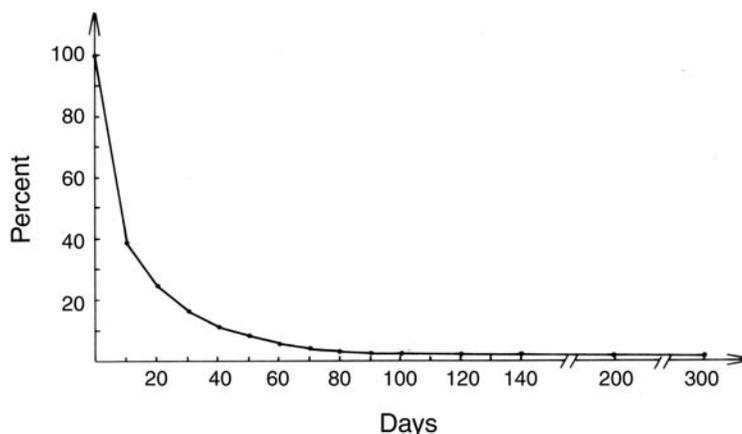
* The signs presented here are not by themselves diagnostic of nonorganic pain but are physical signs indicating illness behavior.

in 20% to 72% of patients.² Most patients recover quickly and without residual loss of function. From 60% to 70% of patients with symptoms severe enough to require work absence return to work within 6 weeks; 80% to 90% return within 12 weeks¹³ (Figure 1). After 12 weeks of symptoms, work return is typically slow.

In general, the course of chronic back pain is characterized by variability and change rather than predictability and stability.³ The continuation of back pain alone does not necessarily imply an unfavorable outcome. Many patients continue to have mild back pain or discomfort for >3 months after seeking care. Mild recurrent or chronic back pain may have little impact on patient function or well-being. As a result, to determine outcome in patients with back pain, activity limitation is probably a better measure than the level of pain.

Nonsurgical Treatment

A considerable variety of nonsurgical treatment alternatives is commonly

Figure 1

Return to work in patients with back pain. (Adapted with permission from Andersson GB, Svensson HO, Oden A: The intensity of work recovery in low back pain. *Spine* 1983;8:880-884.)

used (Table 3). Because the effectiveness of most of these interventions has not yet been proved in high-quality randomized controlled trials (RCTs), the choice of treatment in the patient with low back pain is challenging. The goals are to educate patients, relieve pain, improve function, minimize any adverse effects of

the treatment, and prevent chronicity. With the natural history being one of full recovery, the purpose of management often is to improve on a recovery that will occur anyway. This has important cost- and risk-benefit consequences and also makes intervention studies of acute back pain difficult to analyze; the studies

Table 3
Nonsurgical Treatment Alternatives

Treatment	Subclassification
Education	—
Medication	Analgesics Nonnarcotic Narcotic Topical NSAIDs Muscle relaxants Corticosteroids Antidepressants
Activity modification	—
Exercise therapy	—
Modalities	—
Magnets	—
Manipulation	—
Traction	—
Injections	Epidural Facet Trigger point Sacroiliac
Orthoses	Braces Corsets Unloading corset
Transcutaneous electrical nerve stimulation	—
Acupuncture	—

NSAIDs = nonsteroidal anti-inflammatory drugs

require large sample sizes because 70% to 90% of patients will have improvement in back pain within the first month after onset regardless of treatment.

Treatment Options

Education

A key element of the management of both acute and chronic low back pain is education. Education should include information about correct posture, biomechanics of the spine in activities of daily living, and simple methods that can reduce symptoms. Patients should also be informed about the expected outcome and favorable natural history of low back pain; this information can help them become active participants in their own treatment. Patients must understand the significance of a lifelong commitment to an active treatment program because the most important risk factor for fu-

ture episodes of back pain is a previous episode.

Formal education programs, such as educational booklets or so-called back schools, have limited value when provided in isolation.¹⁴⁻¹⁶ Several RCTs of back schools have been performed and several reviews published. There is no evidence that back schools prevent low back pain;¹⁷ however, some evidence supports back schools as helpful when combined with other rehabilitation efforts.^{6,18,19}

Medication

Medications used in the care of patients with low back pain include analgesics, nonsteroidal anti-inflammatory drugs (NSAIDs), muscle relaxants, and antidepressants. Most patients in pain use an analgesic or NSAID for symptom relief. An additional goal of treatment is prevention of dependence on medication. Because medication is the corner-

stone of nonsurgical treatment, consideration of choices, doses, and duration is important, as is familiarity with potential side effects, including dependence.

Nonnarcotic Analgesics

Acetaminophen is efficacious for mild to moderate pain. Because acetaminophen is relatively safe, inexpensive, and readily available over the counter, it is the recommended drug for most patients with acute low back pain. The accepted highest dose in adults is 4 g/day. Prolonged use of high-dose acetaminophen can result in severe or fatal hepatotoxicity.²⁰ Liver function tests are required in all patients who have taken acetaminophen for more than several months. In addition, acetaminophen use is generally not recommended in patients with chronic low back pain. Acetaminophen should be avoided in patients who abuse alcohol or have a known heredity of liver disease. However, because the risk of renal toxicity associated with acetaminophen use is lower than that linked to NSAIDs, acetaminophen is preferred for patients who present with impaired renal function.²¹ Acetaminophen has no anti-inflammatory or muscle-relaxing effects.

Tramadol is a centrally acting analgesic that is chemically unrelated to opiates and may have a lower potential for abuse than narcotic analgesics. Tramadol has a weak effect on monoamine oxidase receptors in the spinal cord and competes with narcotics; thus, tramadol should not be used concurrently with opioids. Evidence supporting the use of tramadol in the treatment of low back pain is limited. One randomized controlled study of 254 patients with chronic low back pain found that tramadol decreased pain and increased function compared with placebo.²² Tramadol should be used cautiously in patients taking monoamine oxidase inhibitors because tramadol inhibits norepin-

ephrine and serotonin uptake. In addition, dosage reduction is recommended in patients with impaired hepatic or renal function and in persons older than age 75 years. We recommend that the use of tramadol be short-term and reserved for patients with severe pain.

Narcotic Analgesics

Narcotic analgesics should be used judiciously and only in patients whose pain is unresponsive to appropriately prescribed alternative medications or when other analgesics are contraindicated.²³ Because of their addictive potential, narcotic analgesics are not recommended as a first-line agent in the treatment of low back pain. When narcotic analgesics are necessary to address severe back pain, short-term use is recommended. When narcotics are used for long-term pain management, the physician should have a management plan that includes regular follow-up to monitor efficacy, complications, and overuse.

Topical Analgesics

Topical analgesics can be used to treat low back pain either alone or in combination with NSAIDs or oral analgesics. Capsaicin, a popular topical analgesic isolated from hot peppers and available as a cream or in heat pads, has been suggested as a beneficial agent for mild pain relief in patients with low back pain; however, the evidence of effectiveness is weak.²⁴ Capsaicin's mechanism of action is believed to involve the induction and depletion of substance P from sensory C-afferent nociceptive nerve fibers. However, daily multiple applications are necessary for several weeks to experience the effects of capsaicin. The agent is well tolerated, but patients report a burning sensation and an undesirable emanating odor. Mild and harmless adverse effects may develop with capsaicin use, but they are localized and reversible.

The adhesive in the lidocaine 5% skin patch contains the analgesic. Absorption is related to area and time of application. Its main indication is for postherpetic neuralgia, but the patch is used for treatment of musculoskeletal pain, as well. There is no documented benefit in patients with acute or chronic low back pain.

NSAIDs

NSAIDs achieve their effect by inhibiting the body's capability to synthesize the enzyme cyclooxygenase (COX), thus inhibiting the synthesis of prostaglandins. COX-1 protects the stomach lining and intestine; COX-2 is a precursor to prostaglandins that are responsible for pain, fever, and inflammation. First-generation NSAIDs inhibit both COX-1 and COX-2, whereas second-generation NSAIDs are selective COX-2 inhibitors, developed to minimize gastrointestinal and other side effects. Recent evidence of cardiovascular complications related to COX-2 NSAIDs has limited their availability and they are likely contraindicated in chronic low back pain. Current use is limited to celecoxib.

RCTs demonstrate that NSAIDs are more effective than placebos for relieving pain and improving overall symptoms of acute low back pain.^{25,26} They are reasonable first-line medications, but no evidence suggests that one NSAID is superior to another. Indeed, the response varies from one individual to another. Most studies are based on first-generation NSAIDs. Evidence exists that the COX-2 inhibitors are as effective as the first-generation prostaglandin inhibitors in treating a variety of inflammatory conditions; however, few studies specifically evaluate their effectiveness in the treatment of low back pain. At least one early study suggests that COX-2 selective inhibitors are effective agents for the treatment of acute low back pain.²⁷ Additional studies are necessary before any definitive conclusions can be drawn.²⁵

Muscle Relaxants

Muscle spasm is sometimes a component of acute low back pain, but the relationship between pain and spasms is not well understood. Current studies support the use of muscle relaxants in the short-term treatment of acute back pain for selected patients.^{28,29} Muscle relaxants appear to be more effective than placebos, but less effective than NSAIDs, in decreasing the overall symptoms of acute low back pain. When used in conjunction with NSAIDs, they may produce added beneficial effects.^{26,30} These benefits should be carefully weighed against side effects, such as abuse potential, dependence, drowsiness, and dizziness.^{6,19}

There is no evidence of the superiority of one muscle relaxant over another when given in therapeutic doses, but central nervous system side effects vary.³¹ Administration before bedtime can minimize daytime drowsiness while taking advantage of the sedating side effect of the medications. Few published studies evaluate the use of muscle relaxants in patients with chronic back pain. Muscle spasms usually disappear spontaneously with time. Prolonged use of muscle relaxants may result in withdrawal symptoms when abruptly discontinued. Carisoprodol has been designated a controlled substance in some states because of drug abuse and dependency issues, particularly when used in combination with tramadol and oxycodone.

Oral Corticosteroids

Short-term use of oral corticosteroids is effective in patients with radiculopathy;²⁹ however, the role of these drugs in the treatment of back pain without radiculopathy remains unclear. Clinical trials have not shown a statistically significant advantage of oral corticosteroid treatment over placebo therapy; however, sample sizes are generally small, raising questions about the statistical power.³² The potential for severe side effects associated with either

long-term use of oral corticosteroids or with the short-term use of corticosteroids in high doses (>60 mg) limits their use as a first-line agent and precludes their use in patients with chronic low back pain. Short-term use of low-dose corticosteroids appears to be safe.³³

Antidepressants

Pain and mood are closely interrelated.³⁴ Although tricyclic antidepressants, in particular amitriptyline, appear to be useful in managing patients with neurogenic pain, their role in the treatment of low back pain is not well defined.³⁵ The use of antidepressants for acute low back pain is not recommended. However, moderately strong evidence does exist supporting the role of antidepressants in chronic back pain and chronic pain syndromes.^{29,36,37} In patients with chronic back pain and mild depression, antidepressants may be the medication of choice. In patients without depression, antidepressants may still be a reasonable option as an adjunctive medication.³⁸ The potential adverse effects of antidepressant medications should be considered before beginning their use. To minimize the risk of such effects, initial dosages should be low and titrated according to the therapeutic effect.

Sleep disturbance is not uncommon in patients with chronic low back pain and is often related to depression.³⁹ Tricyclic antidepressants may be useful in these patients because of the sedative properties of these drugs, and they are recommended for nighttime use.

Activity Modification

All patients with back pain modify their activities in response to the pain. This subconscious protective mechanism is likely helpful. The uncertainty is to what degree activities causing an increase in pain are detrimental. The usual recommendation is that painful activities be avoided for at least a few days until

the more acute symptoms decrease, but there is no evidence supporting the efficacy of this.

Historically, bed rest was commonly recommended for the treatment of acute low back pain. There is now strong evidence that prolonged bed rest provides no benefit in the management of low back pain, and in many trials, bed rest has even been shown to have a negative effect.^{6,40-43} In fact, studies support activity modification rather than bed rest and immobilization. Moderate physical activity is not harmful and helps avoid the deleterious effects associated with prolonged bed rest.^{44,45} Patients with acute low back pain who stay active recover faster than those who remain inactive. Further, there is less risk of chronic disability and less time off work among patients in activity programs than among those with bed rest.^{41,46}

Patients with chronic low back pain should be encouraged to remain physically active. Fear-avoidance beliefs about work and physical activity (ie, avoidance of work and activities because of fear of increased symptoms) are strongly related to disability caused by back pain.

Passive Physical Therapy

Cold packs, superficial heat, short-wave diathermy, and ultrasound are often elements of physical therapy and chiropractic treatment. Many patients use cold or heat to relieve symptoms; the choice between the two depends on the stage of injury. Cold provides pain relief and reduces the inflammatory response by vasoconstriction following an acute injury. Heat relaxes muscles, improves tolerance to exercise, and may be a reasonable modality when the acute phase is over (after 1 to 2 weeks). Apart from the short-term relief, however, there is no documented value to the use of these passive modalities.^{47,48} A "continuous low-level heat wrap" was found to be superior to ibuprofen and acetaminophen in one industry-

sponsored prospective RCT of subjects with acute low back pain.⁴⁹

Massage Therapy

Massage for back pain is rarely an isolated treatment. Three recent RCTs reported that this therapy is effective for subacute and chronic back pain.⁵⁰ Although there are no direct adverse effects to this therapy, passive treatment in general may negatively influence return to function when provided for long periods.

Exercise Therapy

Exercise therapy does not appear to be more effective than other nonsurgical treatment alternatives in patients with acute low back pain.^{6,20,51,52} Although clinical outcomes are not statistically improved with exercise therapy, the general consensus is that low-impact cardiovascular and aerobic exercises provide other benefits, such as improved mood, increased pain tolerance, and prevention of deconditioning.^{53,54} Low-stress aerobic exercises can be started during the first 2 weeks after the onset of low back pain symptoms.³³ Trunk stabilization and muscle strengthening exercises are not recommended during the acute period of pain because they mechanically stress the back more than do endurance exercises.

Current evidence strongly suggests that exercise therapy is effective in the management of chronic low back pain.^{51,55,56} Symptoms are improved by increased aerobic fitness, restored normal lumbosacral motion, strengthening of trunk muscles, and emphasis of correct body mechanics. Gaber et al⁵⁷ have suggested that individuals with chronic low back pain have an increased incidence of osteopenia and osteoporosis. Although unconfirmed, this conclusion underscores the importance of maintaining some degree of exercise in daily life so that patients with chronic low back pain can reduce the risk of bone demineralization and the associated "fragility fractures."

Magnets

Magnets have been used for centuries to “cure” a variety of ailments, including back pain. Magnets sold for pain are weak and have no effect on circulation or tissue temperature. Controlled trials have found no benefit of magnet therapy for chronic low back pain.⁵⁸

Manipulation

Spinal manipulation is a popular alternative treatment of low back pain. It is estimated that approximately 30% of patients in the United States with low back pain consult health care professionals who perform manual therapy.⁵⁹ Different types of manual therapy exist, including chiropractic and osteopathic. Results of studies reported in the literature are mixed; some trials of manipulation demonstrate positive results, whereas others have shown negative outcomes.^{7,60} The consensus guidelines from the Agency for Healthcare Research and Quality (formerly the Agency for Health Care Policy and Research) state that manual techniques therapy (spinal manipulation) within the first 6 weeks can reduce symptoms.³³

Specific goals should be established at the onset of treatment, and regular follow-up is mandatory. Manipulations should be discontinued and patients reassessed when symptoms persist or when there is evidence of radicular neurologic symptoms associated with manual techniques. Once the acute episode has resolved, no evidence supports the practice of maintenance treatments. The risk of injury from manipulation in appropriately selected and assessed patients is low. Manipulation under general anesthesia, however, is a high-risk practice and is not recommended.⁶⁰ Severe or progressive neurologic deficits are contraindications to manipulation.

Manual therapy in patients with subchronic or chronic pain has not been studied as extensively. Moderate evidence exists that manual ther-

apy provides better short-term relief than does usual care (medication and therapy), and strong evidence exists that the short-term relief is better than placebo therapy.⁵¹ One study of osteopathic manipulative therapy suggests that medication may be reduced in manually treated patients.⁶¹ Combining manipulation with other treatment modalities, such as medication, lifestyle changes, and exercise, may be more effective than manipulation alone, but such combinations have not been studied scientifically.

A recent meta-analysis concluded that there was no evidence that spinal manipulative therapy is superior to other treatments of patients with acute or chronic low back pain.⁶² The Canadian coordinating office for Health Care Technology Assessment recently concluded that chiropractic care for low back pain was similar in effectiveness to standard medical care and physical therapy.⁶³

Traction

There are no high-quality RCTs demonstrating a benefit to traction.^{64,65} In fact, one outcome study demonstrated greater morbidity associated with traction versus sham traction.⁶⁶ In light of the effectiveness of other, more active treatment alternatives, conventional traction is not recommended in the treatment of acute or chronic low back pain.

Vertebral axial decompression (VAX-D) is a traction method in which cyclic tensions of 20 to 40 kg are applied to the spine in a protocol that calls for daily, 30- to 45-minute treatments 5 days per week for an average of 4 to 5 weeks. Uncontrolled clinical trials report good results in about 70% of mixed groups of patients.⁶⁷ One RCT in chronic back pain patients in which transcutaneous electrical nerve stimulation (TENS) was used as a control showed significantly ($P < 0.001$) better results for VAX-D.⁶⁷ All studies of VAX-D are from VAX-D clinics.

Injections

Therapeutic injections without a reasonable presumptive diagnosis should not be provided. Commonly used interventions include epidural, facet joint, trigger point, and sacroiliac joint injections, as well as prolotherapy.

Epidural Corticosteroid Injections

Epidural injections of corticosteroids are often used in chronic low back pain and, not infrequently, in acute pain, particularly when radicular symptoms are present. The injections are performed using interlaminar, caudal, and transforaminal approaches. The effect is believed to result from interruption of the pain-spasm cycle and nociceptor transmission by the local analgesic and by reduced inflammation induced by the corticosteroids.⁶⁸⁻⁷⁰ Corticosteroids stabilize cell membranes, inhibit neural peptide synthesis and action, suppress neuronal discharge, and suppress sensitization of dorsal horn neurons; local anesthetics dampen the C-fiber activity. The caudal injection is performed relatively easily, with minimal risk of dural puncture. The interlaminar technique is more directed, requiring less volume, but it is technically more difficult because of its higher risk of misplacement of the needle. Transforaminal approaches require knowledge about the exact target. To reduce complications and risk of misplacement, fluoroscopy is often used. Without fluoroscopy, the corticosteroid may not reach the epidural space; however, even fluoroscopy does not guarantee correct placement.

Multiple randomized and nonrandomized trials have been conducted, and results of several systematic reviews have been reported, with varying conclusions.^{6,7,71-76} There is weak evidence that corticosteroid injections are effective in patients with radiculopathy, and no evidence that they are effective for acute low back

pain. For chronic low back pain, there is strong evidence that caudal injections provide short-term relief and limited long-term relief. The evidence for interlaminar injections in patients with radiculopathy suggests moderate short-term relief and limited long-term relief. Transforaminal injections carry the strongest evidence for both short- and long-term relief, mainly in patients with radicular symptoms.

Epidural injections are not without risk. Dural puncture, spinal cord injury, epidural hematoma, abscess formation, and nerve damage are rare, but all have been reported as complications associated with such injections. Side effects from corticosteroids are uncommon, but the number of injections should be limited to no more than three in a 6-month period.⁷⁷ A three-injection protocol is not indicated when patients obtain no therapeutic relief after the first or second injection. Epidural injections are not appropriate when there is no indication of radicular nerve-related symptoms.

Facet Joint Injections

Considerable disagreement exists about the role of the facet joints in low back pain. These joints frequently develop osteoarthritis and therefore are a likely source of pain in some patients. Intra-articular facet injections, medial branch blocks, and medial branch neurolysis are all treatments aimed at these joints. The facet joints are richly innervated by branches from the posterior primary rami. Denervation needs to consider the direct, local, and ascending facet branches. The overlapping nature of innervation means that to denervate one segment effectively, three levels may have to be approached.

No evidence supports the use of facet injections in the management of acute low back pain. Facet injections may provide short-term functional improvement in patients with chronic low back pain; however,

their long-term efficacy and superiority over other traditional nonsurgical treatment modalities has not been established.^{78,79} Medial branch blocks were found to provide good short- and long-term relief in one randomized trial.⁸⁰ Radiofrequency neurotomy has also been found to provide short-term relief of chronic low back pain.⁸¹⁻⁸³ Neurotomy should be considered only after multiple facet blocks have been performed.

Trigger Point Injections

Trigger point injections are not indicated for nonspecific acute or chronic low back pain. In patients who have been diagnosed with back pain secondary to myofascial syndrome, injections may be considered. Myofascial trigger points are believed to be the result of hyperirritable foci of taut muscle bands. Focal pressure produces a local twitch response, with pain referred distally.⁸⁴ In most patients, myofascial symptoms respond to stretching, postural correction modalities, and pharmacologic intervention. Trigger point injections should be reserved for patients in whom other interventions have failed. These injections should not be used in isolation but rather be included in a directed exercise program. The number of injections administered should be limited, regardless of their initial effectiveness, because local muscle damage and scarring are associated with repeat injections and can lead to poor functional outcome.⁸⁵

Sacroiliac Joint Injections

Sacroiliac (SI) joint injections are not indicated in the routine management of low back pain. Although the SI joint is usually not a primary pain generator, it can be a common area of referred pain.^{86,87} If the history and physical examination are consistent with SI dysfunction, then diagnostic injections may be considered. Unfortunately, the evidence that SI injec-

tions are of diagnostic value is weak.⁸⁸ SI injections have no documented therapeutic value. However, if these injections are considered, they should be performed under fluoroscopy to confirm correct needle placement. Nevertheless, accuracy is a challenge, even under fluoroscopy.

Prolotherapy

Prolotherapy involves injections with sclerosing agents into ligaments of the back and pelvis. There is no scientific evidence supporting its efficacy.

Orthoses

No evidence exists to support the effectiveness of orthoses in the treatment of acute and chronic low back pain.⁸⁹ There is some slight evidence that orthoses may decrease absenteeism in the workplace.⁹⁰⁻⁹³ The mechanism of action of orthoses is a subject of controversy because orthoses do not improve lumbosacral biomechanics or enhance dynamic lifting capacity.^{93,94} Their effectiveness may be attributed to their capacity as proprioceptive reminders to use correct spine mechanics during lifting and bending activities.^{91,92}

Transcutaneous Electrical Nerve Stimulation

Conflicting evidence supports the use of TENS as treatment of acute low back pain.⁷ The same is true for the effectiveness of TENS as treatment of chronic back pain. RCTs have shown a small short-term effect on pain in two studies, but not in a third.⁶

Acupuncture

Acupuncture is a traditional Chinese medical practice used for more 2,000 years and practiced in the western world since the 1960s. Current literature is mixed as to the role of acupuncture in the management of acute or chronic low back pain. The methodologic quality of RCTs evaluating acupuncture is poor;

therefore, its effectiveness remains unclear.⁵⁰ Few adverse side effects have been reported in association with acupuncture.⁹⁵ At the present time, acupuncture is not recommended as a first-line treatment of low back pain. It may be considered as part of a comprehensive management program in selected patients with chronic low back problems, but it should not be used in lieu of established effective treatment methods.

Behavioral Therapy

Cognitive behavioral therapy has been developed primarily as an element of multidimensional treatment programs for patients with chronic low back pain. This therapy is intended to enhance treatment by addressing cognitive (negative emotions and thoughts) and behavioral (altered activity and medication dependence) aspects of chronic pain.⁹⁶ The benefits of multidimensional programs that include cognitive-behavioral therapy have been demonstrated in comparison with control groups. Studies suggest that quality of life improves and that medication dependency decreases.⁹⁶ No evidence suggests that one method of cognitive behavioral therapy is superior to another.

Summary

Low back pain affects millions worldwide. Costs associated with diagnosis and treatment are considerable. The natural history and treatment of acute and chronic low back pain differ. A variety of nonsurgical treatment modalities are available. Many are moderately effective, but many have no effect or are scientifically poorly investigated. In general, the use of NSAIDs and muscle relaxants has greater effect in relieving pain than do placebos, and implementation of activity speeds up symptomatic recovery and reduces chronic disability. Education of the patient is important to convey the excellent prognosis and enhance

functional outcome associated with nonsurgical management of low back pain. Evidence exists to advise against bed rest, whereas weak evidence supports specific back exercises, injections, and manipulative interventions.

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Evidence-based Medicine: The following references are level I or II studies: 6, 13, 18, 22, 24, 26, 27, 35, 36, 37, 39, 41, 43, 44, 48, 50, 54, 55, 59, 60, 61, 63, 64, 65, 66, 72, 78, 80, 81, 82, 90, and 91.

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