

Most patients can achieve functional restoration

A Rational Approach to the Treatment of Low Back Pain

Brian W. Nelson, MD

ABSTRACT

At the initial visit of a patient with low back pain, the physician must set a positive tone, emphasizing that the problem is common in the human body and can be remedied. Initial treatment is 1 or 2 days of rest, a short course of analgesics, and stretches and other exercises. The 5% to 10% of patients who do not improve within 3 months (chronic-pain patients) or have a relapse frequently require an active functional rehabilitation program. Exercises are helpful only if they focus on the lumbar extensors. Patients may need encouragement at the beginning of the program to tolerate discomfort. Expensive imaging studies are reserved for patients who become disabled or show no improvement. Only when a lesion is identified in a patient who has seriously tried and failed conservative rehabilitation is surgery considered. (*J Musculoskel Med* 1993; 10(5):67-82)

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I have read any number of review articles on the treatment of low back pain, most of them well written and technically accurate. Nevertheless, the next day in the office I'd see another patient complaining of low back pain, and again I would be uncertain of what to do.

As I once did, you may find it depressing to see on your schedule that the next patient's chief complaint is low back pain. Because these patients are so difficult to help, many of us become conditioned to dislike them, and we approach them with a negative attitude. None of us enjoys treating patients we can't help.

Despite this, for the past 3

years, I have limited my practice exclusively to the nonoperative treatment of back and neck pain. I have supervised the treatment of more than 4,000 such patients. At one time, I used traditional treatment methods and had the traditionally poor success rate. Now I believe that most of these patients can be treated effectively. The secret is in knowing what to do (active rehabilitation) and what *not* to do (prolonged passive modalities). Figure 1 is an algorithm of my approach to patients with low back pain.

In this article, I present a step-by-step approach to the patient with low back pain, beginning with history taking and a physical examination to rule out causes of back pain that require urgent measures. I describe the initial regimen of palliation and the criteria for progressing to an active,

This article is the first in a special series on the diagnosis and management of back pain.

intensive program of functional rehabilitation exercises emphasizing lumbar extension. I also discuss the point at which advanced imaging studies are useful, when to consider surgery, and how to manage the patient with intractable back problems.

INITIAL ENCOUNTER

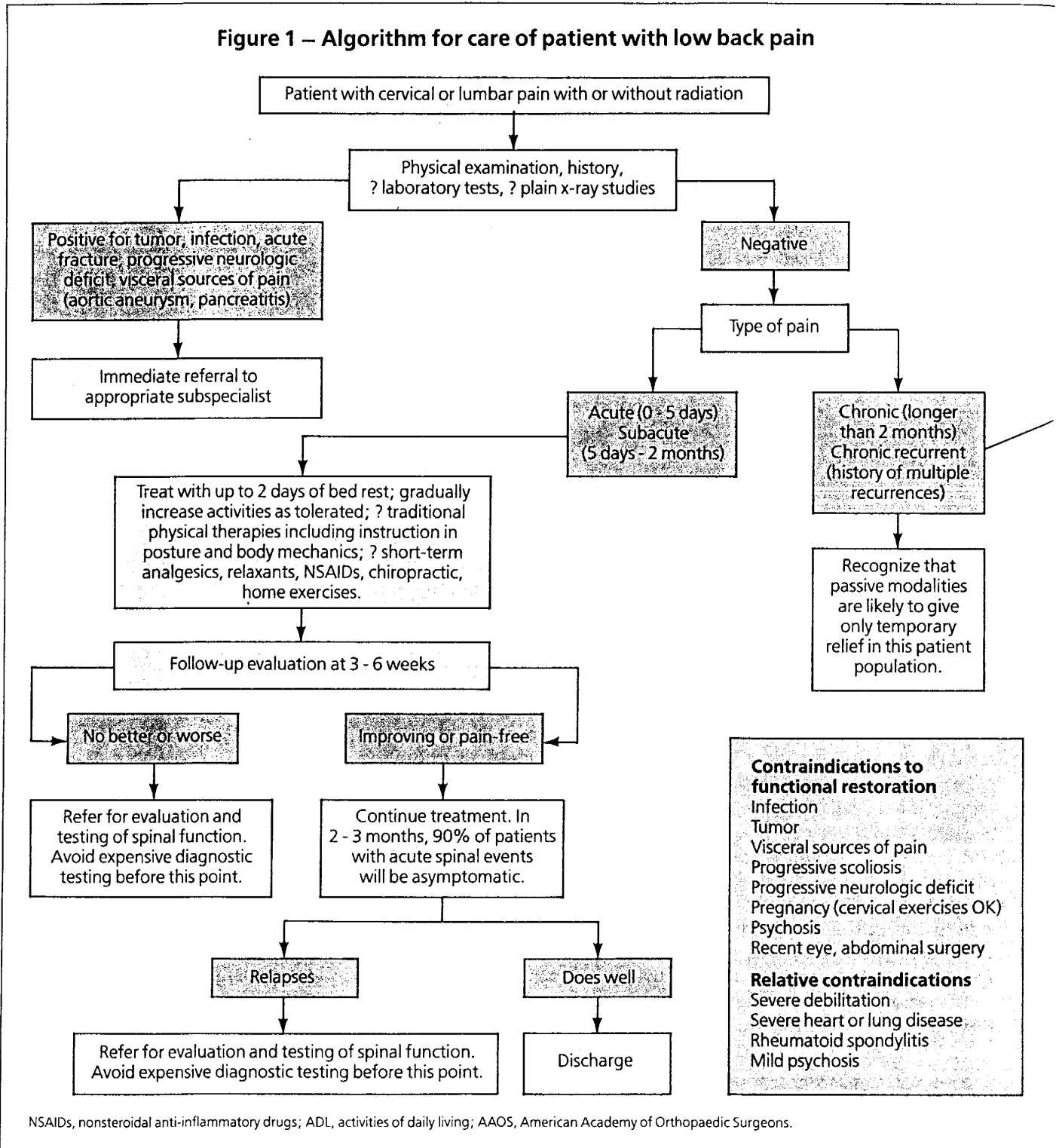
The initial visit may be the most important factor affecting the outcome of a patient with low back problems. During that visit, a psychological template is often created in the patient's mind. If told the injury is serious, the patient easily falls into the sick role. Conversely, if told that back pain is a benign, self-limited condition ubiquitous in humans, the patient may be less likely to take on a seriously "sick" role.

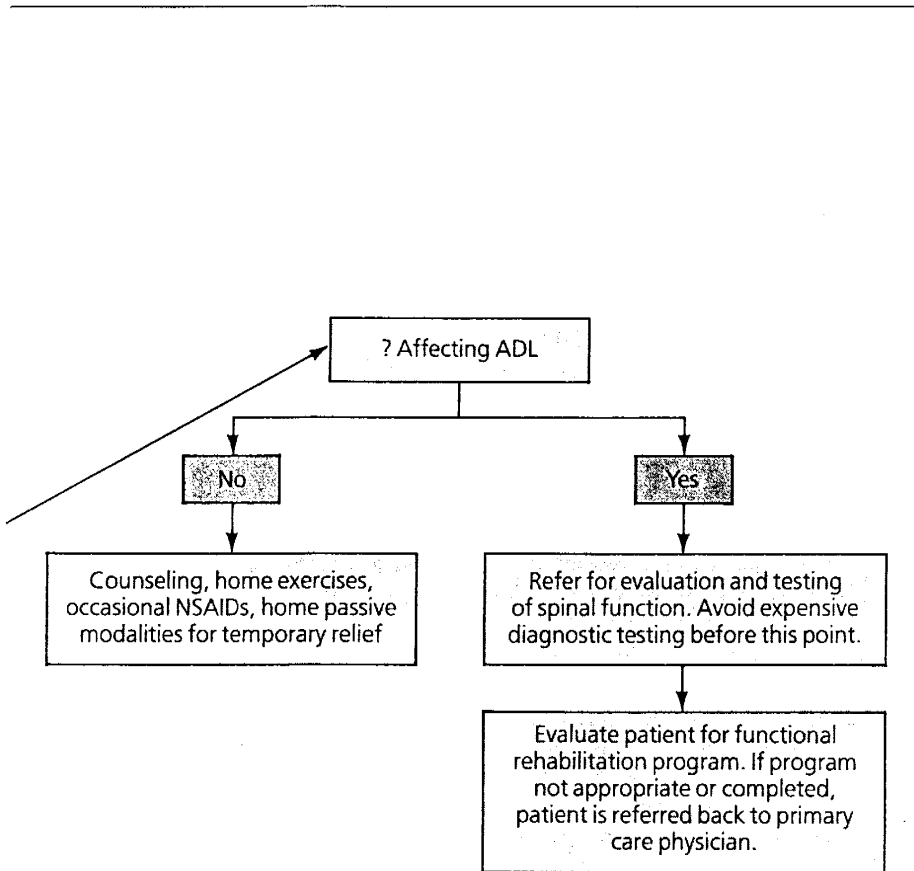
No one knows what causes most back pain, and in only 10% to

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Figure 1 – Algorithm for care of patient with low back pain





Helpful hints

- Be suspicious of pain of gradual onset, pain at night unrelieved by postural change (? tumor); weight loss in elderly patient (? tumor); fever, chills (? infection); injury related to pain (? strain or herniation).
- 90% of disc herniations heal without surgery.
- Treat patients with radiculopathy and static neurologic deficits conservatively. AAOS recommends 3 - 6 months of conservative therapy; most experts recommend observation for at least 1 month.

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15% of the patients can a precise, symptom-related diagnosis be made.¹⁻⁵ The rest of the time we simply do not know. But, reluctant to tell our patients "I don't know," many of us say *something*, and our reports are often contradictory.

The confused patient does not know whom to believe when the chiropractor says that the spine is out of alignment, the surgeon says that the disc has degenerated and vertebrae need to be fused, the physical therapist says that the muscles need electrical stimulation and hot packs, and a neighbor says to wear a copper bracelet and all the pain will go away. The clinician should anticipate this confusion and address it, thereby reducing the chances that the patient will be uncooperative or noncompliant.

The statistics are familiar: following an acute back injury, 70% of patients are significantly improved after 2 weeks, and 90% to 95% are recovered within 2 to 3 months.⁵⁻⁸ Why is it, then, that most patients we see in our offices with acute back injuries do not follow that pattern? The answer, I believe, is that most persons who injure their back never see a physician and never become patients.

Those who seek attention have already selected themselves and are more likely to have chronic problems, or to have more severe injury, or to have a hidden agenda. Whatever the reason, the person with low back pain who seeks medical advice often is among the 5% to 10% who have not improved within 3 months.

Given that a precise diagnosis

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usually cannot be made, a rational approach to the initial visit is to direct efforts at ruling out emergent causes of pain. Normally, by taking a thorough history and performing a thorough physical examination you can exclude tumor, infection, acute fracture, inflammatory arthritis, visceral sources of pain, or progressive neurologic deficit. With such critical diagnoses ruled out, you are able to concentrate on treatment (see "Guidelines for treatment of a patient with lumbar spine complaints," below).

History

The patient's history is probably the best tool for ruling out emergent causes of back pain. Among

the questions to ask are:

- How and when did you first notice the pain?
- Where is the pain located? Does it radiate?
- How is the pain affected by rest? By activity?
- Can the pain be relieved by changing positions?
- Is the pain worse at night? Is there morning stiffness?
- Do you have leg pain, and is it relieved by sitting?
- Do you have any other health problems?
- Is there a history of cancer?
- Have you had weight loss or loss of appetite?
- What social support is available to you?

The answers to these questions

may suggest the need for other diagnostic tests. For example, long-standing night pain unaltered by positional change suggests a space-occupying lesion, and imaging studies would be indicated to rule out tumor. A history of fever and chills with or without a previous infection anywhere in the body would indicate a bone scan to rule out low-grade infection. However, typically more than 90% of the patients will have nonemergent conditions, and in about 85%, an exact diagnosis cannot be made. The Table shows some common symptoms and their possible causes.

Imaging

A great number of mistakes in caring for back pain relate to spinal imaging. When unsure of the cause of spinal pain, it may be tempting to blame a "spur" or "degenerated disc" seen on an x-ray film or to order another test. Such abnormalities are equally present in symptomatic and asymptomatic persons, however, and thus may be unrelated to the present symptoms.⁹⁻¹²

Magnetic resonance imaging (MRI) studies are expensive (\$600 to \$1,200 each), their yield of clinically useful information is poor, and they should not be used as screening tools in these instances. Furthermore, the vast majority of magnetic resonance scans are read as abnormal, with findings of bulging disc, desiccation at L5-S1, or facet arthrosis; unfortunately, the patient frequently is not told that abnormalities seen on spinal MRI may be unrelated to pain.

Moreover, we tend to forget

Guidelines for treatment of a patient with lumbar spine complaints

- Most patients with back pain can be helped. If a back problem cannot be cured, function should at least be optimized.
- Imaging abnormalities are equally common in persons with and without back problems.
- Teach patients that back pain is common and does not necessarily signify a permanently impaired life.
- The key decision point in treatment is 3 to 6 weeks postinjury. Back pain should be spontaneously improved at this time, although not necessarily cured. If noticeable improvement has not occurred, a functional restoration program is strongly indicated. Reserve expensive imaging studies for those patients not responding to an active rehabilitation program.
- Refer patients to a physical therapy center that emphasizes functional restoration rather than pain relief.
- Make sure that the rehabilitation supervisor understands the difference between lumbar function and pelvic function.
- Explain to the patient that "hurt" does not equal "harm."
- Surgery is a last resort for most patients, considered only for the patient who has failed a good, active functional restoration program.
- Patients with chronic spinal pain that cannot be cured need to be taught strategies to deal with the problem. They are not well served by seeking a cure that does not exist. They need compassion, education, and a good home exercise program.

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how intimidating space-age technology may be for a layperson. Lying in an MRI scanner can be a stressful experience and may convince patients that their problem must be serious if such powerful equipment is required.

When is a computed tomographic (CT) or MRI study indicated? Only when the results have the potential to change the treatment plan. The cost of a CT scan is approximately half that of a magnetic resonance scan. CT is better for visualizing bony lesions, whereas MRI is superior at depicting soft tissue. Two case examples of conditions that may prompt you to order CT or MRI are discussed in "When advanced imaging may be useful."

Rest or exercise?

I am currently participating in a clinical study of chronic low back pain, involving the long-term follow-up of patients who have completed a rehabilitation program. More than one patient has criticized my care because a subsequent physician ordered an MRI study that showed the bulging disc or arthritis or degeneration that I "missed." Had I discovered the "true" cause of the pain, they believe, I would not have prescribed exercise, stretching, and proper body mechanics. I would have told them to "take it easy."

But taking it easy does not work for chronic back pain. The Quebec Task Force on Spinal Disorders report, generally considered a balanced and fair evaluation of the passive treatment modalities for chronic back pain, concluded that no passive modalities appear to have any lasting effect.³ Rest is

Table – Low back pain: Symptoms and causes

Symptom	Possible cause
Sharp, narrow band of pain radiating below the knee	Herniated disc
"Stocking-glove" numbness	Referred pain, nonorganic pain
Night pain unrelieved by positional change	Tumor
Fever, chills, sweats	Infection
Long-standing back pain aggravated by activity	Deconditioning
Pain increased by sitting	Discogenic disease
Leg pain increased by walking and relieved by standing	Vascular claudication
Leg pain increased by walking, unaffected by standing, but relieved by sitting	Neurologic claudication
Chronic spinal pain in patient with unsatisfying job or home life	Stress
Global pain	Nonorganic pain
Morning stiffness that improves as day goes on	Inflammatory arthritis
Unremitting, throbbing lumbar pain	Aortic aneurysm
Abdominal pain radiating to midback	Pancreatitis, gastrointestinal reflux disease, peptic ulcer disease
Back pain in athletic teenager	Epiphysitis, juvenile discogenic disease, spondylolysis, or spondylolisthesis
Back pain dating to a specific injury	Strain or sprain

simply another passive modality, with the added disadvantage that it promotes muscle atrophy, cartilage degeneration, stiffness, and depression. Passive modalities are appropriate in the early stages of an acute injury but have no place in the treatment of chronic pain.

Although there are certain spi-

nal conditions that require a reduced activity level, in my experience, the far greater danger for most patients is in doing too little, not too much.

Acute or chronic pain?

To make rational treatment choices, you must first understand the physiologic distinction

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between acute and chronic pain. After a back injury, the body automatically begins the healing process, and soft-tissue healing usually is complete by 7 to 8 weeks. Nerve damage is generally secondary to another insult, such as pressure from a herniated disc or chemical irritation associated with inflammation. Treatment of nerve damage or irritation is therefore directed at the primary injury. Nerve tissue often takes longer than 7 to 8 weeks to heal. It is less resilient than many other human tissues and is more susceptible to permanent damage.

If pain persists beyond 7 to 8 weeks, it is properly labeled chronic. Since the body has the capacity to heal itself, the goals of treatment following acute injury are to:

- Keep the patient as comfortable

as possible while the body is healing itself.

- Protect the injured body part.
- If possible, avoid treatment that results in disuse atrophy, joint stiffness, loss of strength or endurance, or depression.

These goals are met by using passive modalities, such as hot and cold packs, electrical stimulation, massage, and ultrasonography, in the acute phase to provide palliation while the healing process progresses. Bed rest beyond 1 or 2 days is avoided, to prevent rapid deconditioning. Also helpful is education for the patient about back protection strategies, including postural advice (lying supine with the hips and knees flexed to 90° to reduce discal pressure), lifting strategies (keeping objects close to the body and lifting with the legs rather

than the back), and stabilization techniques (finding the body's neutral position and tightening the trunk muscles to stabilize that position).

Early introduction of stretches and back exercises that emphasize the lumbar extensors can promote the healing mechanism. These exercises include prone lumbar extensions, prone lower trunk rotations, the single-knee-to-chest stretch, pelvic tilt, and diagonal abdominal curl-up.

Most patients improve rapidly. The patient who is not improving after 4 to 8 weeks is at high risk for becoming a chronic-back pain patient. It is these patients who generate about 85% of the costs associated with back pain.³ What can you do to prevent a chronic condition from developing?

The choices for the next step

When advanced imaging may be useful

Order advanced imaging (computed tomography [CT], magnetic resonance imaging [MRI]) if the results have the potential to change the treatment plan. If treatment is likely to remain unchanged regardless of imaging results, do not order scans. Two case histories highlight the appropriate point in management for ordering MRI or CT studies.

Case 1

A patient complains of right leg pain radiating to the calf and lateral foot that started with a lifting injury 3 days earlier. Physical examination shows limited range of motion, diminished right ankle jerk, and loss of sensation in the lateral right foot. Straight leg raising at 50° reproduces sharp pain down to the foot. Ankle plantar flexion is mildly weak. Diagnosis of a herniated disc at the L5-S1 level can probably be made without help of a scan.

Provided the neurologic deficits are not progressive, conservative care is indicated. If the pain and neurologic deficits progress despite adequate conservative care, the patient becomes

a surgical candidate, and an imaging study is then indicated to define the lesion.

Case 2

A 40-year-old male laborer complains of chronic low back pain radiating into the right buttock. Pain is exacerbated by activity and occasionally has caused the patient to miss time from work. There is nothing in the history to suggest a tumor, infection, fracture, or inflammatory arthritis. Physical examination reveals lumbar stiffness and some muscle tenderness, but otherwise is unremarkable except for some nondermatomal hyperesthesia in the left leg.

An MRI study will not alter the results of treatment in this patient. Even if disc degeneration or herniation is found on imaging, the patient is not now an operative candidate, because the symptoms do not interfere with activities of daily living. If he becomes unable to work and incapacitated, then surgery may be considered, and an imaging study would be indicated to determine if a surgically correctable lesion is present.

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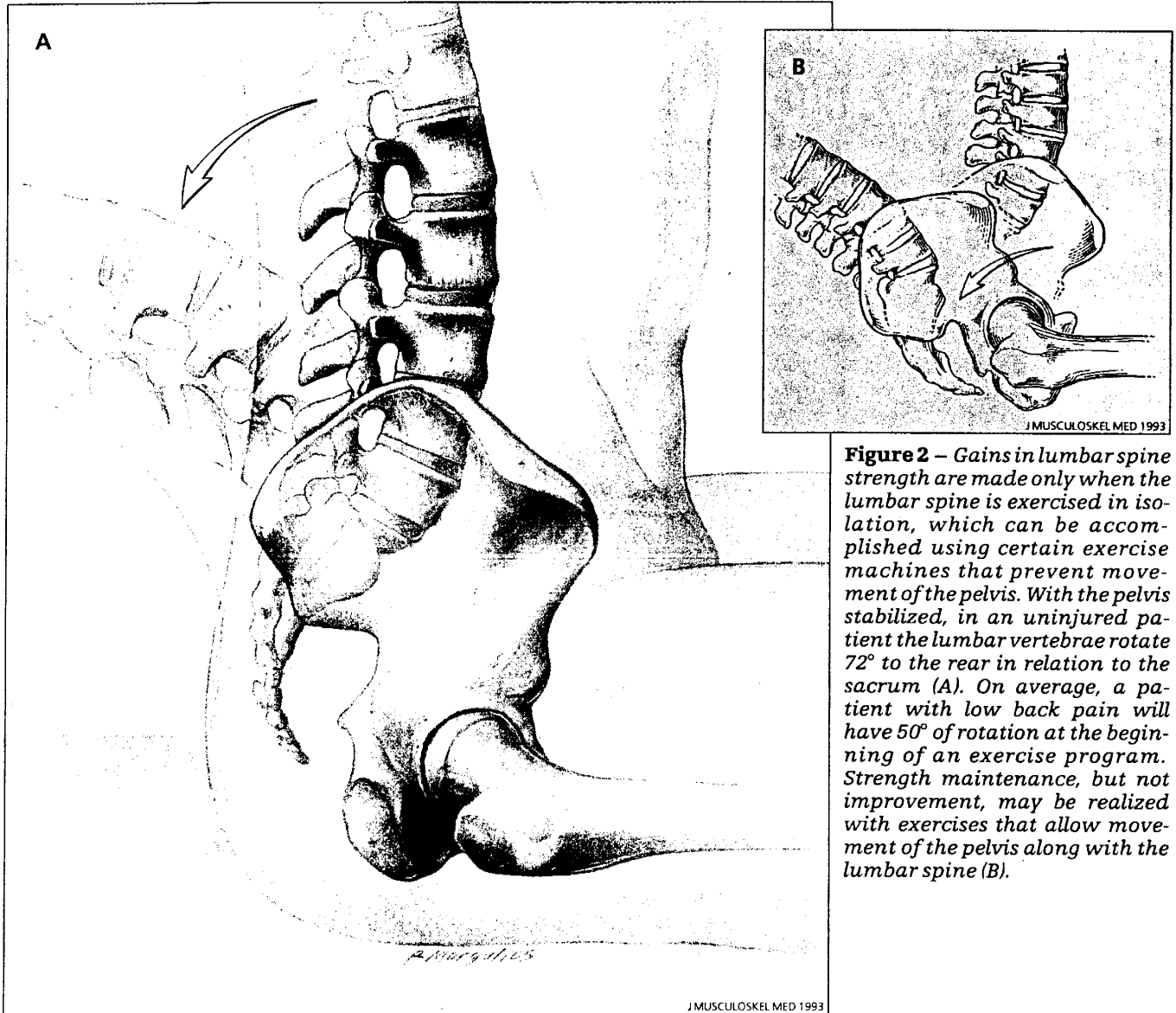


Figure 2 – Gains in lumbar spine strength are made only when the lumbar spine is exercised in isolation, which can be accomplished using certain exercise machines that prevent movement of the pelvis. With the pelvis stabilized, in an uninjured patient the lumbar vertebrae rotate 72° to the rear in relation to the sacrum (A). On average, a patient with low back pain will have 50° of rotation at the beginning of an exercise program. Strength maintenance, but not improvement, may be realized with exercises that allow movement of the pelvis along with the lumbar spine (B).

are vast: more tests (electromyogram, CT, MRI, discogram, dynamic roentgenogram); more treatment (traction, aquatic therapy, epidural injections, massage, transcutaneous electric nerve stimulation); referral to a specialist (orthopedic surgeon, neurosurgeon, neurologist, physiatrist); or observe and recheck.

Or you can prescribe functional rehabilitation, which provides the best chance for a good outcome and is also cost-effective.

LUMBAR OR PELVIC FUNCTION

It is possible for a body to be strong everywhere except the back; to be in excellent physical

condition but still have a weak back.

Swimming, bicycling, weight lifting, jogging, and walking all are excellent exercises, but none specifically improve spinal function, nor do any strengthen a spine that is weak, stiff, or atrophied. The back can be meaningfully exercised only when the

lumbar spine is moving against resistance.

The difficulty in achieving true back exercise is demonstrated by a "low back" exercise machine, on which a patient sits, leans backward against a thoracic pad attached to a stack of weights, and performs multiple repetitions against resistance. These machines do not exercise the lumbar spine. Rather, they exercise the pelvic extensors, the hamstrings, and glutei.

A patient with a sore back will reflexively change body mechanics to protect the back, substituting pelvic motion for lumbar motion. Even with a severe lumbar injury, a patient may work out on an exercise machine, all the while protecting the lumbar spine from meaningful exercise. Figure 2 illustrates the difference between isolated lumbar motion and combined lumbar and pelvic motion.

A study at the University of Florida confirmed that vigorous exercise on low-back machines does not build strength in the lumbar spine.^{13,14} Seventy-seven volunteers were tested for isolated lumbar extensor strength, then were divided into three groups: 41 completed a program of exercise on standard "back" exercise machines typically found in physical therapy clinics; 21 exercised on equipment that isolated the lumbar extensors by stabilizing the pelvis and allowing no pelvic motion; 15 did no exercise and served as a control group.

At the end of the 12 weeks there was no significant difference ($P < .05$) in lumbar extensor strength between the standard-machine group and the no-exercise group.

There was a large increase in back strength, however, averaging 120% in the fully extended position, in the group that did lumbar extension exercises with the pelvis stabilized. The investigators concluded that exercise without pelvic stabilization was not effective for developing strength in the lumbar extensors.

Thus, while standard exercise machines may contribute to a well-rounded rehabilitation program, they do not exercise the lumbar extensors. Some patients may be reluctant to exercise a painful lumbar spine, but they must do so to produce true improvement in lumbar function. Patients usually are willing to work through the initial pain, provided they are convinced that their effort will help their back problem. They must be "sold" on exercise, and this is a responsibility of both the physician and the therapist. Without education and encouragement, many patients quit with the first discomfort.

Meaningful lumbar strengthening can be done only with the use of equipment that stabilizes the pelvis and isolates the lumbar spine. Such equipment usually is available only in professional settings. However, patients can do exercises at home to maintain strength. They will not make gains, but they can maintain current strength with a home-based rehabilitation program.

FUNCTIONAL RESTORATION

For the vast majority of patients, the best approach to rehabilitation of back problems is functional restoration: treatment designed to restore spinal strength,

endurance, and flexibility to its normal state. ("Functional restoration" as used here does not include psychological, vocational, social, and dietary interventions, as it does in some centers.) A functional restoration program presupposes that normal function is known and that the ability to accurately measure function is available.

The goal of such treatment is to normalize function, not to decrease pain, although pain relief is a desirable by-product. If function cannot be normalized, it should at least be maximized, so that a patient reaches as high a functional level as possible. Functional restoration is best accomplished through a program of progressive resistive exercise to strengthen the trunk muscles, especially the lumbar extensors.

Such rehabilitative efforts may involve some patient discomfort, especially in a previously sedentary patient. However, provided the exercises are controlled and supervised by a professional, no damage will be done. Pain need not be interpreted as a warning to stop exercising. Many investigators have found that patients with chronic back pain have pain early in a rehabilitation program and experience the benefits only after a month or more.¹⁵⁻¹⁸

An accurate baseline measure of functional ability is established at the initial examination. Pain that increases during a rehabilitation program can be characterized as "bad" (pain associated with deteriorating physical examination parameters and decreasing spinal function as measured by a physical therapist), or

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"good" (pain associated with improvement in objective function and in physical examination parameters, or at least with no negative changes).

If the pain is "bad," then treatment needs to be modified. Exercise frequency or intensity may need to be reduced or a certain exercise stopped. Further diagnostic testing may be in order. If the pain is "good," rehabilitation continues.

Even if the patient experiences some discomfort at the beginning of a vigorous rehabilitation program, treatment should continue as long as the patient is measurably, objectively increasing lumbar function. On average, 18 sessions over 2 to 3 months are needed to optimize function.^{13,19-21}

CHOOSING A FACILITY

The clinician who refers back pain patients for rehabilitation should become acquainted with the facility and the therapists or physicians who will be guiding the rehabilitation. A visit to the physical therapy center may help ensure that patients are well supervised in a program emphasizing functional restoration.

It is important that the center accurately measures strength, flexibility, and endurance. It should have equipment to provide valid and reproducible measurements of lumbar function and exercise machines that stabilize the pelvis, thus allowing for meaningful lumbar exercise.

The center should develop goals for each patient and make clear to each patient that the purpose of rehabilitation is to improve spinal function—not to de-

crease pain. As mentioned previously, the majority of patients able to improve spinal function will also experience a decrease in pain, which is often dramatic but which remains a secondary goal.

EDUCATION

A proper goal of treatment is for patients to learn to manage back problems on their own. You may find it helpful to make available patient bulletins on various topics. Giving patients a page of information, written in layman's terms, on such topics as the incidence of false-positive results of imaging studies, when surgery is and is not indicated, and the importance of and rationale for exercise, may save you time and act as a reminder of important information for the patient.

Dependence

In our zeal to help patients, we sometimes disable them. They become dependent on our participation and the medical system for pills, tests, permission not to work, and continual therapy.

But if from the beginning of treatment the focus is on teaching patients to be their own back doctors, dependence can be avoided. First, explain to patients that back pain is a normal part of human experience. To be alive is to know back pain. Then guide them in maximizing their spinal function, using aggressive, intensive exercise. Also, teach lifelong strategies, such as body mechanics, stabilization, and home exercises, for dealing with the condition. Instilling these attitudes early fosters independence and better outcomes. For an acute epi-

sode of back pain, muscle relaxants and nonsteroidal anti-inflammatory drugs may have a place short term but are to be avoided as long-term medication.

SURGERY

Even strong proponents of non-operative care for most spinal conditions are not necessarily opposed to surgery. However, surgical treatment, especially fusion for chronic back pain, should be considered only under the following circumstances:

- The patient has failed a good functional restoration program and has intractable pain significantly affecting the activities of daily living.
- The patient has shown a good-faith effort to get well and does not demonstrate undue signs of symptom exaggeration.
- A specific surgical lesion understood to be causing the pain can be identified.

I have treated dozens of patients thought to be surgical candidates who, after an aggressive functional restoration program, significantly improved and were able to avoid surgery. Preliminary studies suggest that the improvement is lasting. Among 950 patients who completed a rehabilitation program, 220 had entered the program believing they were surgical candidates, either because of previous diagnosis or severity of the pain. At postprogram follow-up averaging 13 months, 71% of these believed that rehabilitation had allowed them to avoid surgery.

Surgery for a patient showing signs of symptom exaggeration is not recommended. The outcome

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is usually poor, with patients often continuing to complain of severe symptoms. Similarly, patients treated surgically for poorly defined back pain tend to do poorly. The Quebec Task Force on Spinal Disorders reported that surgery for back pain alone is an unproven remedy.³ Surgery should be reserved for patients who meet strict criteria.

Treatment with functional restoration, on the other hand, is usually successful, especially in patients with lumbar disc syndrome, spondylolysis, spondylolisthesis, degenerative arthritis, degenerative disc disease, lumbar strain, or mechanical low back pain. Elderly patients with spinal stenosis and significant leg pain may also achieve lasting relief through exercise. These patients usually show significant and sometimes dramatic increases in strength, flexibility, and endurance.

THE INTRACTABLE PROBLEM

Despite our best efforts, physicians and patients must recognize that some patients cannot be cured. Some cannot even be helped to improve.

The best strategy to use with such patients is honesty and compassion, along with time. Talk at length with the patient and explain why more treatment or diagnostic testing is not warranted. Counsel the patient on proper body mechanics and exercise, explain that such injuries cannot be effectively treated with rest and inactivity, and provide reassurance that "hurt" does not necessarily mean "harm."

If a patient fails an appropriate

rehabilitation program and does not have an identifiable surgical lesion (fewer than 5% do), then further treatment is, at best, palliative and will have no lasting effect. Patients who accept the situation and try to resume a normal life usually do best.

A rational strategy based on the known physiology of soft tissue is most effective in treating back pain. Being able to offer help to a patient with spinal pain may change a depressing physician/patient experience into a rewarding one. ■

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