Clinical basics

Rheumatology: 13. Minimizing disability in patients with low-back pain

Peter C. Wing

The case

A 37-year-old, right-handed man does much of the cooking in the small restaurant that he owns. After several months of nagging, but usually manageable, intermittent low-back ache, he awakens one morning with left buttock pain that rapidly progresses over 2–3 days to quite severe sciatica radiating down to the lateral border of his foot. The patient's symptoms do not improve over the course of the following week. He is otherwise healthy. The results of the physical examination (10 days after onset) are normal except that his back is stiff: the lumbar flexion increment is 3/15 cm (the normal increment is 7/15 cm). The left calf lacks 1.5 cm in circumference in comparison with the right leg. The left ankle plantar flexors are a little weaker on repetitive toe-standing. The lateral border of the foot is numb. The left ankle jerk is diminished. The straight-leg-raising test produces sciatic pain at 30°, and this sign of nerve root irritation is confirmed by a positive bowstring sign.

This article provides a review of common back pain. The reader must recognize that back and radiating pain may result from disease processes elsewhere, such as the liver, bowel or kidney, or from pathological processes arising in or close to the spine. Although these are very important, they are a much less frequent cause of disability in adults. After 1 month of back pain, 4%–5% of patients will be found to have have a disc hernia, 4%–5% will have symptoms of spinal stenosis and perhaps 1% will be diagnosed with a visceral disorder or a renal or gynecological problem.[1] Space does not allow for a detailed discussion of certain critical aspects of the back-pain problem; in particular, the reader must look elsewhere for current concepts in the management of chronic pain.

Low-back and sciatic pain are common, distressing, sometimes hard to diagnose accurately and often frustrating for the managing physician. If the pain becomes chronic, long periods of disability may result. Much of the information on the management of low-back pain is poor, and much treatment is based on little or no evidence. Jonsson[2] notes the surprising "fact that so little research of high scientific validity has been done on such a huge and common problem." Although the total financial cost of back pain is about 3 times higher than that of cancer, only 0.2% of all randomized clinical trials concern back pain despite a significant increase in the number of such trials during the last decade. Jonsson and Nachemson stress the vital need for the decisions of patients, politicians, employers, employees and medical personnel to be based on current evidence rated by stringent criteria for scientific validity.[3] Major reports, such as that of the Quebec Task Force on Spinal Disorders,[4] the United States Agency for Health Care Policy and Research (AHCPR) clinical practice guidelines for the management of acute low-back pain[5,6] and the clinical guidelines for the management of acute low-back pain of the Royal College of General Practitioners in the United Kingdom,[7] have paved the way for higher levels of evidence on which to base practice in this field. As the guidelines from different countries have similar general approaches,[8] this review will focus mainly on the recommendations of the US version.

Because most low-back pain episodes fade rapidly, the well-informed primary physician is in the best position to provide most of the evidenced-based care that the patient needs and should be able to advise the patient as choices of care are

Review

Synthèse

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This article has been peer reviewed.

CMAJ 2001;164(10):1459-68

This series has been reviewed and endorsed by the Canadian Rheumatology Association.

The Arthritis Society salutes CMAJ *for its extensive series of articles on arthritis. The Society believes that this kind of information is crucial to educating physicians about this devastating disease.*

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made. The science of clinical care is rapidly improving, but much treatment is still based on basic principles or on professional or personal biases. Simple education of the patient, reassurance, management of pain and sleep loss, and assistance in keeping involved in work and recreational activities are effective approaches based on the best evidence available. Surgery is infrequently needed.

Epidemiology of low-back pain

Back or spinal pain is the most common musculoskeletal cause of physical impairment. Cassidy and colleagues found that 28.4% of adults aged 20–69 years in Saskatchewan currently experience low-back pain, and 84% had experienced it in their lifetime, with varying degrees of disability.[9] Some 6%–7% of the population in the United Kingdom consult their physician about back pain in a 1-year period.[10] Although it was formerly thought that most acute episodes of back pain resolve satisfactorily within a few weeks, 66%–75% of patients still have at least mild back pain 1 month after seeking care.[11] It is becoming clearer that although most patients will cease to consult their physician about the back pain within 3 months, pain and disability persist at 1 year after an acute episode of new low-back pain in as many as 75% of patients, prompting the comment that "low back pain should be viewed as a chronic problem with an untidy pattern of grumbling symptoms and periods of relative freedom from pain and disability interspersed with acute episodes, exacerbations, and recurrences".[10]

Most (90%) herniated lumbar discs occur at L4–5 or L5–S1; many patients with an acute disc herniation can also expect a flare-up of the pain within the first few months.

Of spine-related impairments not involving trauma, about 80% are said to occur in the low back, although this may underrepresent the increasing number of older people with osteoporotic problems that may affect the thoracic spine. Although the peak age of onset of low-back symptoms is in the middle years of life, structural back problems increase with age. Degenerative changes that are visible on radiographs are almost universal in people over 80 years of age, with only a small percentage having discs that appear normal on radiographs.

Causes and risk factors

"Disease" in the spine, such as a primary or metastatic tumour, or infection, is relatively uncommon. The nature of the pain in such cases is relatively constant and nonmechanical, and the clinical course is often progressive. A neurological deficit can ensue and constitutes a clinical emergency.

"Normal" back pain, however, is very common and may be related to the ligaments or to pathology of the disc, yet the mechanisms leading to this pain are unclear. The annulus fibrosus or outer layer of the disc has a greater collagen content but contains less water than the inner nucleus pulposus. There is marginal metabolism in the nucleus, in that it has no circulation and receives nutrients by diffusion through the vertebral cartilaginous end plates from the vertebral capillary bed. The disc contains collagen, proteoglycans and water. The water content of the nucleus is 80% at the age of 18 years, and 65% at the age of 65 years. Variation in water content may explain nightly (evening to morning) height changes ranging from approximately 2% of total height at the age of 5 years to 0.5% at the age of 90 years. The gross appearance of the transected disc changes with age, with delamination of the annulus beginning during a patient's twenties and thirties and radial clefts during the thirties and forties, followed by gradual loss of water content and changes in the proteoglycan content of the nucleus. Fig. 1 shows a young, healthy lumbar disc and a markedly degenerative disc. The disc is the major weight-bearing component of the 3-joint complex known as the vertebral motion segment. With disc narrowing, changes in the vertebral bodies may be seen using MRI; the facets bear more weight and ligamentous stresses may be increased. Whereas the inner changes in the disc are not likely to be

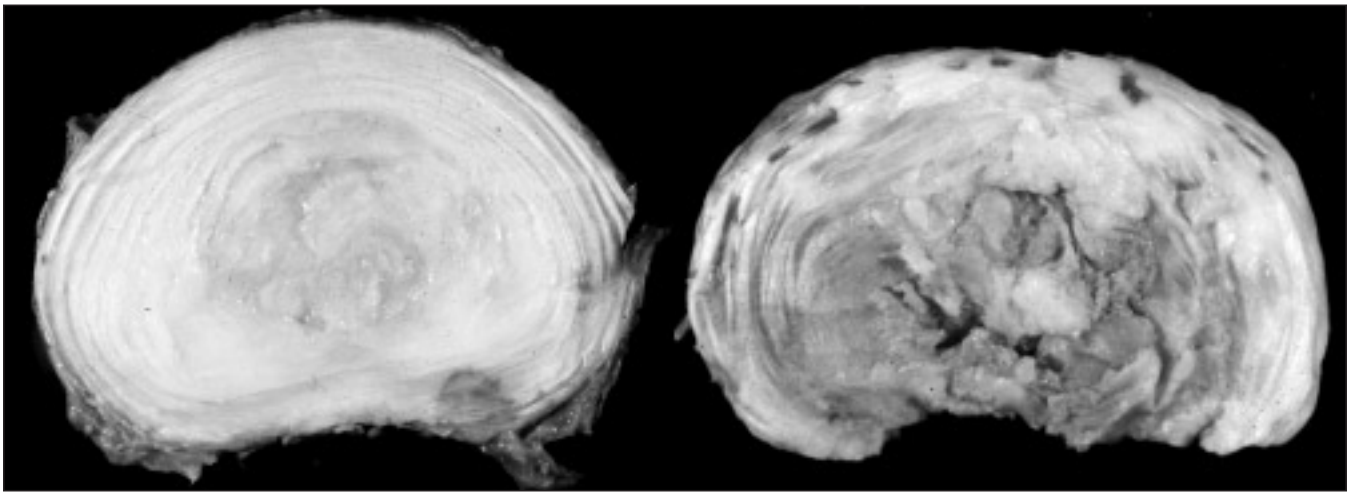

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Fig. 1: Cross-sectional appearance of the lumbar disc in youth (left) and in old age (right).

painful (there are no nerve endings in the disc), any of the secondary changes *may* be painful. Back pain has been associated with relative narrowing of the spinal canal, major postural spine deformities or true leg-length discrepancy over 1.5 cm, which can also be associated with osteoarthritis of the hip of the longer limb. The changed physical loading associated with degeneration may lead to pain, because reduction of disc height leads to increased loading of the facets, which eventually wear away.

Age-related changes in the lower back can be detected using radiology, CT and MRI, but these changes are only weakly correlated with the presence of pain and are found in both symptomatic and asymptomatic populations (as are disc herniations). The peak age for the onset of sciatica is in the early forties, with men being afflicted more often. Low-back pain is equally common in men and women, with a peak age of onset in patients' thirties to fifties, and some workers have found a second peak in the incidence of back pain in older women. This may be related to the effects of osteoporosis, which is not a risk factor per se, although an increased risk of pain is found with increasing numbers of vertebral compression fractures.

Known correlates of back pain include cigarette smoking, which is also associated with anatomic changes in the low back such as increased disc degeneration. Back and sciatic pain are somewhat more common in patients with the highest degrees of obesity. Pain is also more likely in those who spend prolonged periods of time commuting in a vehicle, or who are subject to certain frequencies of whole-body vibration as in the operation of heavy earth-moving equipment.[12,13]

Disability in patients with low-back pain

Carlsson and Nachemson[14] state that "a few patho-anatomically demonstrable diseases have a clearer association with back pain (including) disc herniation, spondylolisthesis, severe degeneration, osteoporosis with fractures, spinal stenosis, infections, and rheumatoid diseases such as ankylosing spondylitis." They also state that "no patho-anatomic changes have been found in muscles, tendons and ligaments and no MRI investigations have demonstrated any significant abnormality in patients with 'ordinary' mechanical or idiopathic back pain." Basic scientific studies of human tissues have thus far failed to find any specific marker for pathological changes in the vertebral motion segment of patients with back pain compared with changes found in individuals of comparable age. So far, Carlsson and Nachemson say of the extensive biomechanical studies that "none of them could pinpoint the nociceptive process for back pain." They conclude that "all structures in the lumbar motion segment … disc[s,] vertebrae, posterior facets, muscles, ligaments and so forth can be sources of pain."

Wear and tear of the vertebral motion segment is normal, and if pain is the result, it may not be disabling. Disability from back pain involves physical and behavioural components. Disability is an umbrella term for impairments, activity limitations and participation restrictions denoting the negative aspects of the interaction between an individual with a health condition and environmental and personal factors affecting that individual.[15] We should not underestimate the extent to which psychological and social processes can influence physical activity and vice versa; our concepts of impairment and disability must allow for this dynamic interaction. Issues of disability that prevent patients from working are complex and appear to be closely linked with both the physical aspects and the social aspects of work difficulty and job dissatisfaction.[16,17] Thus, disability associated with low-back pain has been linked both with lack of physical fitness and with unusually heavy physical work or repetitive lifting. However, the patient's perception of the work environment is more important than that of an outside observer: disability that prevents a patient from working is seen more often when the patient is working at a boring, repetitious or dissatisfying occupation.

Diagnosis and treatment

An anatomic diagnosis is not usually needed to begin care for a new episode of low-back pain. Guidelines can help the general practitioner manage a patient presenting with acute or chronic back pain. Because of the natural history of an acute episode of low-back pain, the management of a patient's problem will depend upon the duration of symptoms and other factors such as age, type of work and physical fitness.

Acute low-back pain and sciatic symptoms

The AHCPR clinical practice guidelines[5,6] define acute low-back problems as "activity intolerance due to lower back or back-related leg symptoms of less than 3 months' duration. About 90% of patients with acute low back problems spontaneously recover activity tolerance within 1 month." The principles of early management are simple: ensure that no serious underlying pathology (such as spinal fracture, tumour, infection, cauda equina syndrome or nonspinal condition) is the cause of the pain, provide initial treatment of symptoms while the favourable natural history eases most of the symptoms, and educate the patient to help prevent or manage future episodes. The AHCPR clinical practice guidelines outline this process, beginning with a series of "red flags" or physical risk factors that must be evaluated (Table 1). The red flags are cues from the history or the physical examination that a serious underlying condition may be present.

A simple history and physical examination will reveal these indicators.[5] However, some patients may require a more extensive neurological examination. Table 2 shows the function of the more commonly involved spinal nerves. In other patients, a clinical "red flag" may indicate the need for early imaging or laboratory investigation. For example, an older person, especially a postmenopausal woman, who has the sudden onset of troublesome pain with minor stress

should have a radiograph to look for a pathological fracture of a vertebra weakened by bone loss (see upcoming article in this series on osteoporosis by John P. Wade).

At the initial assessment, the examining physician should pay attention to behavioural concerns, exploring problems with work difficulty, family pressures or fear of the back pain. The Waddell nonorganic signs (as revisited recently by Main and Waddell[18]), which are features found on physical examination, are markers of distress and may suggest that the patient's disability is disproportionate to the extent of the organic pathology. Categories of these signs include historical features, overreaction, inappropriate tenderness, pain on simulated spine motion by the examiner, changes in test findings when patient is distracted (such as the straight-leg-raising test performed sitting and recumbent) and regional disturbances on sensory and motor testing. They are helpful in patient management but may also indicate the need for a psychological assessment. Kendall and colleagues have suggested that the evaluation of psychosocial "yellow flags" may also be helpful in identifying people at risk of developing long-term disability, inactivity and work loss. Their questionnaire quantifies the degree to which patients have become overwhelmed by their pain.[19] These factors that may worsen the experience of pain and impede rehabilitation should always be considered in the evaluation of a patient with back pain.

In the absence of physical "red flags," initial care for the patient will include the basic steps of education and assurance. The manner in which we present the message and our expectations for the patient may shape the therapeutic response:[20] the physician's optimism concerning the usually benign course of low-back pain helps the patient cope with today's pain. The physician should help improve the patient's level of comfort using medication combined with recommendations to alter activity (Table 3). Rapid improvement is usual, although sciatica may resolve more

Table 2: Functions of the nerves commonly affected by a lumbar disc herniation

Spinal nerve root	Sensory area	Major motor function	Reflex
L3	Medial knee	Knee extension	Knee jerk
L4	Medial foot	Knee extension; ankle inversion, extension	Knee jerk
L5	First web space	Hip abduction, ankle extension, great toe extension	
S1	Lateral border of foot	Ankle flexion	Ankle jerk
S2	Posterior thigh and calf	Ankle flexion	Ankle jerk
S3-5	Perianal area	Sphincters	Bulbocavernosus, anal wink

Table 1: Red flags for potentially serious conditions listed by the AHCPR[5,6]

	Possible fracture	Possible tumour or infection	Possible cauda equina syndrome
From medical history	Major trauma, such as vehicle accident or fall from height	Age > 50 yr or < 20 yr	Saddle block anesthesia
		History of cancer	
	Minor trauma or even strenuous lifting (in an older or potentially osteoporotic patient)	Constitutional symptoms, such as recent fever or chills or unexplained weight loss	Recent onset of bladder dysfunction, such as urinary retention, increased frequency or overflow incontinence
		Risk factors for spinal infection: recent bacterial infection (e.g., urinary tract infection), injection drug abuse or immune suppression (from steroids, transplant or HIV)	Severe or progressive neurologic deficit in the lower extremity
		Pain that worsens when supine, severe nighttime pain	
From physical examination			Unexpected laxity of the anal sphincter
			Perianal/perineal sensory loss
			Major motor weakness: quadriceps (knee extension weakness), ankle plantar flexors, evertors and dorsiflexors (foot drop)

Note: AHCPR = Agency for Health Care Policy and Research.

slowly than simple back pain. Manipulation may help: a current large-scale trial in the United Kingdom is examining a number of aspects of an integrated package for the provision of care to patients with back pain in a primary care environment, which may provide a higher level of evidence concerning the role of manipulation (www.york.ac.uk/org/ukbeam/ukbeam).

Subacute low-back pain and sciatic symptoms

The patient with persistent low-back pain that does not begin to improve within 4 weeks should be reassessed by the family physician, with a further history-taking and physical examination, again bearing in mind the red flags and use of the nonorganic physical signs. Plain anteroposterior and lateral radiographs should now be ordered, and general health concerns should be addressed.

If radiographs do not reveal a problem, but the patient seems unwell or the pain is nonmechanical in nature, a bone scan may identify a focus of irritation, which can be better evaluated by a subsequent CT scan. It may be necessary to refer the patient to a specialist at this stage. The choice of specialist can be confusing. You may know your local experts; if not, the suggestions in Table 4 may be helpful.

Persistent sciatic pain without red flags that does not settle by 3 or 4 weeks may be the result of a disc herniation. However, disc herniation symptoms resolve with time in most patients. Disc tissue has been shown to resorb on late follow-up CT scans: the percentage of this resorption is greater with larger herniations. The best-known randomized study suggested little difference in the final outcome of surgical and nonsurgical treatment,[22] but more recent analyses point to a somewhat faster and more complete recovery with surgery in carefully selected patients who may decide to follow the surgical route.[23–25] Because of various identified surgical risks (anesthetic complications, infection, neurological damage and others), a conservative approach may be preferable. Recent evidence supports the use of a nerve root block with added steroid as a way of avoiding surgery.[26] Unless there is progressive loss of strength or sensation or the involvement of more than one spinal nerve (which should lead to urgent surgical assessment), the patient should be sent for radiographs at 4 weeks, then for a CT scan and should be referred to a spine surgeon by about 6 weeks. As may be seen in Table 5, CT is not needed unless a red flag is identified, or if surgery is being considered. Surgery may speed recovery, but the patient should understand the risks and benefits of surgery. Surgi-

Table 3: Components of initial treatment (0–4 wk)[5,21]

Patient education
Comfort measures
• Nonprescription medications: acetaminophen, ASA or NSAIDs
• Heat or cold for use at home
• Manipulation (except if root symptoms are present); stop and re-evaluate if ineffective after 4 wk
Activity alteration for a few weeks
• Avoid irritation: reduce bending and lifting, change position often
• Minimize rest; at most a few days
Exercise
• Low-stress incremental aerobic program, e.g., walking, cycling, swimming
• Specific exercise later if needed, e.g., abdominal exercises
• Work-related exercise as needed
Getting on with life as normally as possible[20]
Work continuation or return, graduated if necessary
Avoidance of overuse of unproven palliative efforts

Note: NSAID = nonsteroidal anti-inflammatory drug.

Table 4: When and to whom should patients with subacute low-back pain and sciatic symptoms be referred?

Finding	Action
Single-root involvement on clinical assessment	Obtain CT scan of appropriate levels and refer to spine surgeon* if not beginning to improve within 4–6 wk
Deficit in more than one root; same side or contralateral, progressive root loss; or loss of bladder control	Urgent referral to surgeon
Red flag screen suggests fracture, infection or tumour	Obtain further imaging (bone scan/CT/MRI), consider urgent referral to spine surgeon or other relevant specialist
Upper motor neuron signs	Refer to a neurologist
Signs of joint inflammation or difficulty with pain management	Refer to a rheumatologist
Persistent and troublesome localized low-back pain, or features suggestive of spinal stenosis	Order radiograph and refer to rheumatologist, physiatrist or spine surgeon
Difficulty with disability management	Is job-attached rehabilitation available? Refer to physiatrist, occupational therapist or both
Chronic behavioural problem or features of a chronic pain syndrome	Refer to a pain clinic for interdisciplinary assessment and treatment

*A spine surgeon is an orthopedic surgeon or neurosurgeon, sometimes with further subspecialty training.

cal treatment rates vary greatly in different regions (in British Columbia, the number of discectomy operations per 100 000 population performed in 1994 varied between the extremes of 21 per 100 000 and 180 per 100 000 in different health regions). You can help ensure that your patient has sound indications for surgery: symptoms and signs of root irritation and deficit with confirmatory imaging and failure to begin to improve despite 4 weeks of conservative treatment, or severe or progressive neurological deficit.

If a re-evaluation fails to reveal serious or remediable pathology, the principles of rehabilitation for the patient with subacute back pain are still based on simple fixed-schedule analgesia and the maintenance of an active life including work activity. Do not use bedrest as treatment; if a patient is confined to bed for a short while because of pain, focus on restoration of activity. There is some evidence in favour of the use of manual therapy within the first 6 weeks or so of an episode of back pain but not sciatica. There is conflicting evidence on the role of back schools, that is, treatment focused on an educational intervention, and no evidence to favour the use of any specific exercise program. There is evidence that (where available) job-attached rehabilitation will lead to less long-term disability than conventional approaches because physical and vocational issues can be addressed simultaneously,[27] and there is moderate evidence that the clinician's attitude and positive reinforcement can have a beneficial effect.[1]

Chronic low-back pain

When pain is long-standing, the physician must assess the relative organic components of any pain arising from the spine in excess of "normal" back pain. The characteristics of this pain may be mechanical (increasing pain with movement or physical loading) or nonmechanical (equally present at rest). Mechanical disorders are truly musculoskeletal, and may include back ligament or muscle injury (sprain), disc disease, facet osteoarthritis, spondylolisthesis and spinal stenosis. In some people with these conditions, disability (what the patient reports being unable to do) is proportional to observed impairment; in others this seems not to be so. When the pain seems to be local and disabling, imaging should be carried out and a referral made to a specialist if a diagnosis is not apparent.

Back pain is frequently the major symptom in chronic pain syndromes, and ongoing care requires a sound understanding of chronic pain management, much of which is undertaken on an ongoing basis by the primary care physician. An interdisciplinary assessment may help determine the proportional importance of the many possible factors that contribute to a patient's perception of being disabled.

Table 5: When to obtain imaging for low-back complaints?

Radiograph (anteroposterior and lateral views of the lumbar spine)
- Major trauma potentially causing a fracture
- Minor trauma where pain suggests a pathological fracture
- Unusual pain at night or at rest, suggesting infection or tumour
- Other low-back or sciatic pain that does not improve over 4 wk

CT scan (commonly L3–S1, depending on the likely level of the pathology)
- Imaging of choice for a suspected lumbar disc being considered for surgical treatment
- To provide detail of a potentially unstable fracture
- To clarify any abnormality (area of increased isotope uptake) seen on bone scan
- To localize pathology if spinal stenosis is suspected

MRI
- To ascertain the extent of a known tumour
- For recurrent or unremitting postsurgical sciatic pain
- In selected patients, as a preoperative measure

Key points

- Back or spinal pain is the most common musculoskeletal cause of physical impairment. Some 30%–60% of the general population experience back pain, and about 80% of spine-related impairments occur in the low back.
- Although most episodes of acute back pain are limited to about 6 weeks, the rate of recurrence is quite high.
- The onset of low-back symptoms occurs most often during middle age, but structural back problems increase with age as disc degeneration takes place.
- After ensuring that an acute episode of back pain is not a result of underlying pathology, the physician will treat symptoms and educate the patient to prevent future episodes.
- The physician should note signs of distress in the patient resulting, for example, from work-related problems or family pressures.
- Acute low-back pain that does not begin to improve within 4 weeks should be reassessed by the family physician; imaging should be ordered, followed by appropriate referral.
- Chronic low-back pain may be the result of mechanical (pain greater with movement or physical loading) or nonmechanical (pain present at rest or with motion) causes.
- When chronic low-back pain seems to be local and disabling, imaging should be carried out and referral to a specialist made if a diagnosis is not apparent.
- Spinal fusion is a technique used to eliminate pain from a damaged or worn segment of the spine by stiffening that level.
- Although spinal fusion is useful for treating unstable fractures, advanced single-level degeneration, spondylolisthesis with degeneration or nerve root entrapment and, occasionally, severe degenerative scoliosis, some patients do not achieve the relief of symptoms that they hope for.

Usually, this will involve an examination of social issues (including difficulties in work and family life), general physical health and musculoskeletal fitness. In making recommendations for the treatment of chronic back pain, van Tulder and colleagues[28] based their recommendations on a recent literature review, a report of the Clinical Standards Advisory Group Committee in the United Kingdom on back pain and a Dutch general practice guideline on low-back pain, leading to the following principles:

- Information. The main objective is to prevent or reduce disability physically and mentally and to improve the patient's quality of life and function. An emphasis on coping with the symptoms and managing pain should minimize dependence on medical treatment.
- Drug therapy. Avoid long-term drug treatment. Use analgesics to facilitate a gradual increase in activities, and do not prescribe "to be taken as required."
- Manual therapy. There is no specific evidence to support one particular type of therapy, and there is conflicting evidence for its long-term effectiveness.
- Exercise therapy. No evidence supports the recommendation of one specific type of exercise over others; the intensity of exercise should be increased incrementally according to a fixed schedule.
- Multidisciplinary treatment. Patients with severe long-lasting low-back pain and disability or high use of medical services for back pain should be referred to a multidisciplinary treatment program aimed at functional restoration, behavioural management or pain management.

The aim of spinal fusion is to eliminate pain from a damaged or worn vertebral motion segment by stiffening that level. It can be a good operation for unstable fractures, in which metallic instrumentation is generally used as well as the placing of a bone graft to encourage the vertebrae to heal together. It is also used for advanced local single-level degeneration of the disc or facets, for degenerative or isthmic spondylolisthesis with degeneration or nerve root entrapment and, occasionally, for severe degenerative scoliosis. The complications can include infection (2%–6% deep infection rate), root damage, delayed union or nonunion and, of course, disappointment. Some patients do not achieve the relief of symptoms that they hope for, for a variety of reasons. The stiffening of one level can led to secondary adjacent degeneration after a number of years. Poorer surgical outcomes are seen in patients receiving workers' compensation.[24] Poorer results of surgery are also associated with smoking, with a lower fusion rate in smokers than in nonsmokers.

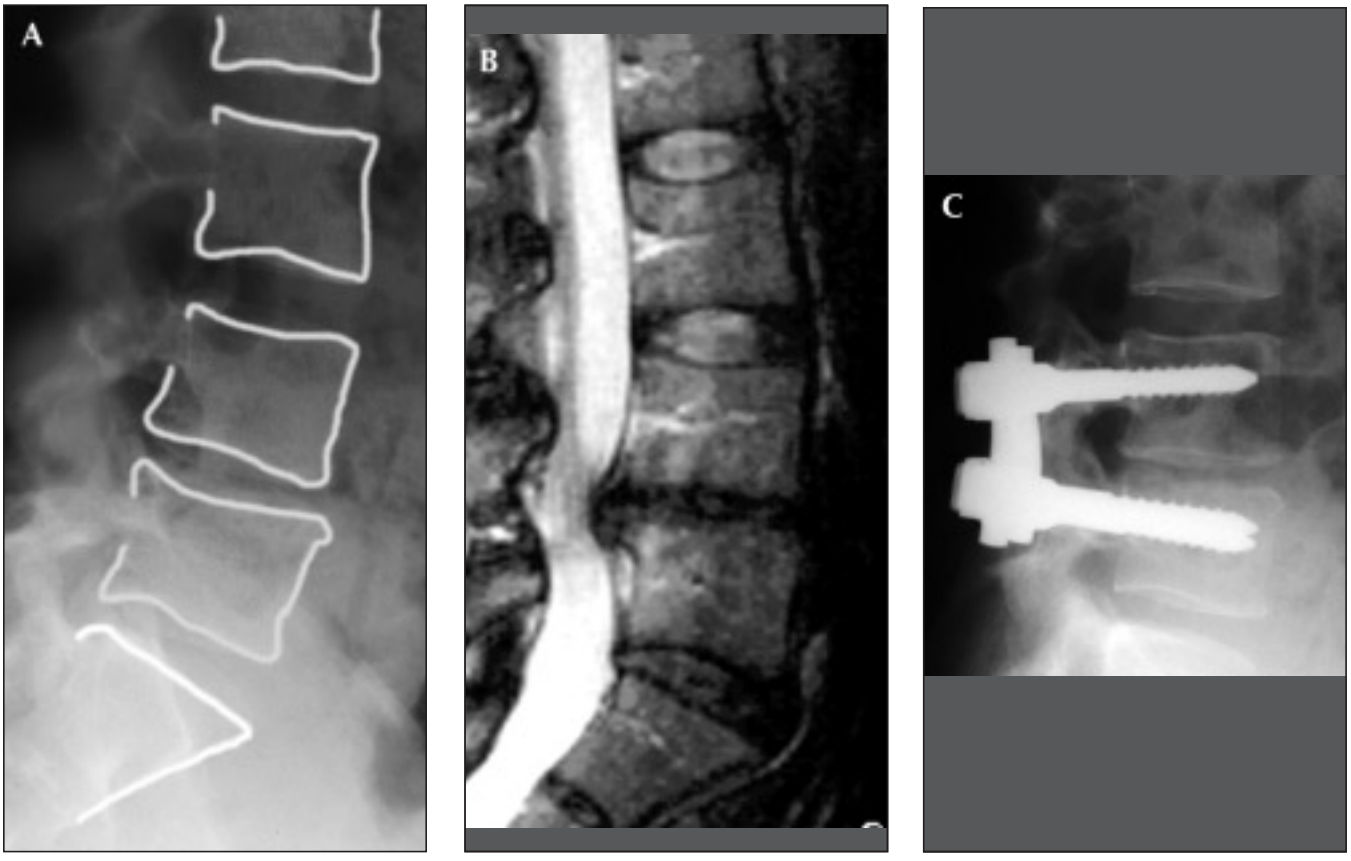

Fig. 2: L4–5 degeneration in an active middle-aged runner. A. The lateral radiograph shows L4–5 narrowing and slight retrospondylolisthesis. B. The magnetic resonance image shows effacement and darkening of this disc with annular bulging of the "deflated" disc. C. Instrumented fusion: postoperative lateral radiograph taken in flexion.

The symptoms of well-localized degeneration as shown by MRI in Fig. 2 can be considerably improved by fusion, but the risks of surgery are significant and the outcome not as predictable as, for example, total hip or knee replacement for osteoarthrosis. Fusion using titanium screws and rods ("instrumentation") and iliac crest bone graft helped this patient return to competitive running. (The role of instrumentation in spinal fusion remains uncertain, because the final clinical outcome may be no better for patients in whom it is used with a bone graft than for those in whom bone graft alone is used.)

After a period of several months of increased pain possibly related to degenerative disc disease, the person whose scans are shown in Fig. 3 considered surgery. The MRI scans were taken to assess the degree of degenerative change in the lumbar spine. However, the pain faded over the next few months and the patient elected to continue coping with the discomfort, although at a level of significantly reduced recreational activity.

Spinal stenosis is the narrowing of the vertebral or intervertebral canal, which is often due to a combination of congenital and degenerative causes. Other causes such as Paget's disease or other metabolic bone diseases are seen less commonly. Spinal stenosis generally becomes symptomatic in older people. Back pain may radiate to the buttock and down the leg, often in a dermatomal manner. The patient typically has pain on standing or walking a variable distance that will only settle with lumbar flexion, especially sitting. The pain of spinal stenosis is not provoked by cycling, a fact that may allow the sufferer to maintain fitness with the help of an exercise bicycle. Radiographic findings of degeneration are common, and a CT scan will show central stenosis well; stenosis of the nerve root canal is sometimes more difficult to see with the standard CT technique and MRI can be useful in the planning of any surgery. Conservative treatment may include epidural or nerve root injections with local anesthetic and steroid performed by a radiologist or anesthetist; this is potentially helpful for diagnosis as well as for treatment. The long-term outlook is usually benign because of the very slow progress of symptoms in some individuals. However, when symptoms begin to affect the patient's quality of life, surgery may be helpful but has a significant morbidity. Decompression must be directed accurately, which is often difficult, and at times fusion is needed to prevent later instability.

Ankylosing spondylitis should be suspected in the younger man with a slowly progressive, intermittent, dull aching low-back pain and stiffness: spine pain is the presenting symptom in 80% of patients with this condition. The prevalence of the spondyloarthropathies, including ankylosing spondylitis, varies geographically.[29] It is less common and often milder in women. There may be a positive family history, and individuals are at greater risk if they have a parent who is HLA-B27-positive. The major symptom in the spine is an aching that is worse with inactivity and may waken the patient from sleep. Peripheral joint disease occurs in the first 10 years in 30% of patients. Varied constitutional symptoms may be described. On examination, reduced lumbar mobility, chest expansion and sacroiliac tenderness can be found. Radiographic changes are seen in the sacroiliac joints and in all parts of spine, especially in the apophyseal joints. An individual with ankylosing spondylitis may have a past history of iritis or may present with iritis. Aortitis and carditis are late manifestations. Other seronegative spondyloarthropathies occur in association with Reiter's syndrome, psoriasis, Crohn's disease and ulcerative colitis. The treatment is directed at the control of pain and stiffness with anti-inflammatory medications and exercises. The major peripheral joints are more likely to need surgery, but occasionally spinal surgery can help by

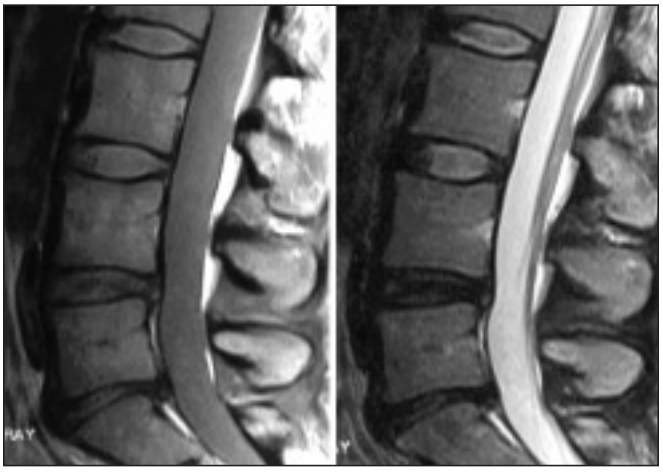

Fig. 3: T_1-weighted (left) and T_2-weighted (right) images of the lumbosacral spine showing degeneration with loss of disc height at the L5–S1 level, disc signal changes without loss of height at L4–5 and normal disc above this. This image did not alter management.

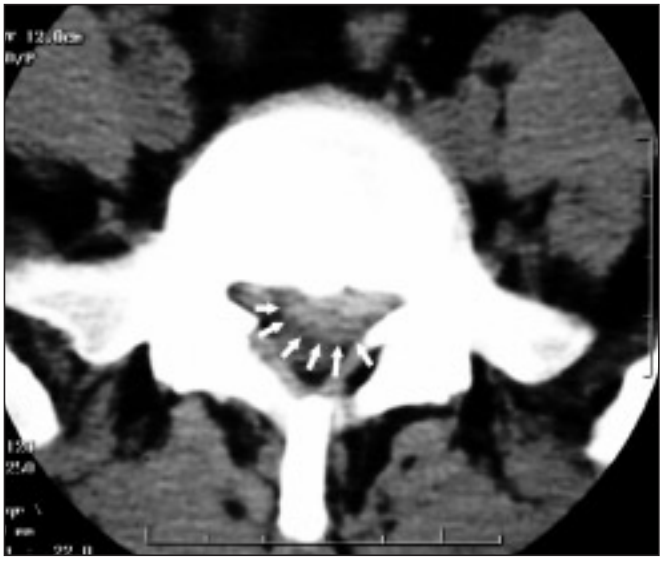

Fig. 4: CT scan showing left L5–S1 herniated nucleus pulposus causing S1 root syndrome.

correcting deformity. Fractures in ankylosing spondylitis may be difficult to see on radiographs, so CT should be considered early in the patient known to have the condition and who complains of new spine pain with even seemingly minor trauma. Any change in visual "horizon" such that the erect patient cannot see as far as before must be assumed to be caused by a new fracture; early treatment for this is much easier than after a few weeks. Surgery may be needed for selected fractures or complications of fracture such as a hematoma with progressive neurological deficit or to manage spondylodiscitis, a condition in which a fracture through the ankylosed spine does not heal.

Returning to the case

The 37-year-old patient showed symptoms strongly suggestive of an acute disc herniation, most probably at the L5–S1 level, because the left S1 nerve root appeared to be involved. No "red flags" were identified, nor did the patient show any nonorganic physical findings to indicate emotional distress. At this stage, conservative management should include reassuring education about his condition;[20] one of the popular back pain books, such as those by Hall[30] or Fine,[31] may help. He may require a simple analgesic or nonsteroidal anti-inflammatory drug during working hours and a minor opioid at night for days to weeks, but prolonged use should be avoided. If possible, he might consider working part-time and getting help with physical tasks at work. He should take a short daily walk on a graduated basis, that is, walking a little further several times each day, but he should avoid unproven passive treatments. If his symptoms worsen or they do not begin to resolve by 4 weeks, anteroposterior and lateral radiographs of the lumbar spine should be taken, followed by a CT scan (L3 or L4 to sacrum) in consultation with a spine surgeon.

A CT scan showing, for example, a large left-sided L5–S1 disc herniation (Fig. 4) would confirm the diagnosis, and the surgeon might suggest an S1 nerve root block or surgical discectomy. There is reasonable evidence to support the use of one of the techniques of discectomy when recovery from the pain of disc hernation is slow or protracted, but it is unclear what the effect of discectomy is on the natural history of disc degeneration and back pain. The reported success of discectomy in selected patients varies from about 70%–95%, although patients receiving workers' compensation may not do as well for various reasons. The patient whose scan is shown in Fig. 4 had troublesome pain for 4–5 months that faded to an insignificant level while he was waiting for surgery, which was therefore cancelled; several months later, he continues to do well without analgesics. This is probably because of lessening of the chemically mediated irritation of the disc herniation and, possibly, a slow resolution of mechanical compression (mechanical compression alone is not painful). Should our patient develop the relatively rare cauda equina syndrome, urgent surgery to relieve multiple root compression would be undertaken, although some degree of permanent deficit would probably persist despite surgery in this case.

Although sciatica can often resolve with or without surgery, the associated back pain may, as shown by population surveys, continue to be a problem for that patient. Our task is to work with the patient to minimize disability resulting from the pain and to allow the patient to have a productive and enjoyable life, while dealing with an often recurrent nuisance.

Competing interests: None declared.

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