# Timing of surgery for sciatica

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## REVIEW OF LITERATURE

**Diagnosis and treatment of sciatica**

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## Introduction

Sciatica affects many patients who are commonly treated in primary health care settings, but a small proportion of patients are referred to secondary care and may eventually undergo surgery. Many synonyms for sciatica are being used in the literature such as lumbosacral radicular syndrome, ischias, nerve root pain and nerve root entrapment.

The most important symptoms are pain radiating in the leg and related disability. In approximately 90 % of the cases, sciatica is caused by a herniated disk with associated nerve root compression, but lumbar stenoses and (less frequently) tumors are also possible causes. The diagnostic and therapeutic management of patients with sciatica is characterized by a considerable variation within and between countries. There is, for example, a striking variation in the surgery rates for lumbar diskectomy between countries[46]. A more recent publication confirms the still large variation of disk surgery, even within one country[50]. This may in part be caused by a paucity of evidence regarding the value of diagnostic and therapeutic interventions and the lack of clear clinical guidelines, but may also reflect differences in health care and insurance systems. This review presents the current state-of-science regarding the diagnosis and treatment of sciatica.

## Methods

We used the Cochrane library to identify relevant systematic reviews evaluating the effectiveness of conservative and surgical interventions for sciatica. Medline searches up to december 2006 were used to find other relevant systematic reviews on diagnosis and treatment of low back pain. Keywords were sciatica, hernia nuclei pulposi, ischias, nerve root entrapment, systematic review, meta-analysis, diagnosis, and treatment. In addition, our personal files were used for additional references, including a few publications of recently conducted randomized clinical trials. Finally we checked if clinical guidelines were available.

### *Who gets it?*

Exact figures on the incidence and prevalence of sciatica are lacking. In general, an estimated 5-10 % of patients with low back pain suffer from sciatica, while reported lifetime prevalences of low back pain range from 49 % to 70 %(w2). Direct estimates of (disk-related) sciatica in the open population show an annual prevalence rate of 2.2 % (2). A few individual and occupational risk factors for the occurrence of sciatica have been reported (table 1). Factors that have been associated with the occurrence

**Table 1.** Risk factors for acute sciatica[62;70]

| | **Occurrence** |
|---|---|
| Individual factors | Age (peak 45-64 years)<br>Length (higher)<br>Smoking<br>Mental stress |
| Occupational factors | Strenuous physical activity: Frequent lifting especially while bending and twisting<br>Occupational driving of motor vehicle, including whole-body vibration |

of sciatica include age, length, mental stress, cigarette smoking and some occupational factors such as exposure to vehicular vibration (w2,2,3) For an association of sciatica with gender or physical fitness there is conflicting evidence (w2,2,3).

***How is it diagnosed?***

The diagnostic process is mainly based on history taking and physical examination. By definition the patients suffer from radiating pain in the leg. Patients may be asked to report the distribution of their pain and whether the pain radiates below the knee. Pain drawings may be used to evaluate the distribution of pain. Sciatica is characterised by radiating pain following a dermatomal pattern. Patients may also report sensory symptoms. Physical examination largely depends on neurological testing. The most applied test is the straight leg raising (SLR) test or Lasègue's sign. Patients with sciatica may also suffer from low back pain, but the back pain is usually less severe than the leg pain. The diagnostic value of history and physical examination has not been well studied[51]. There are no history items or physical examination tests with both high sensitivity and high specificity. The pooled sensitivity of the straight leg raising test is estimated to be 91 % with a corresponding pooled specificity of 26 %[52]. The only test with a high specificity is the crossed SLR test with a pooled specificity of 88 % but the sensitivity is only 29 %[52]. Overall, if a patient reports the typical radiating pain in one leg combined with a positive result on one or more neurological tests indicating nerve root tension or neurological deficit the diagnosis sciatica seems justified. Table 2 shows the signs and symptoms that are relevant for the distinction between sciatica and non-specific low back pain.

***What is the value of imaging?***

Diagnostic imaging is, in general, only useful if its results influence further management of the patient. In acute sciatica, the diagnosis will be based on history taking and physical examination and treatment will be conservative (non-surgical). Imag-

| **Table 2**. Indicators for sciatica. |
|---|
| Unilateral leg pain > LBP |
| Radiates to foot or toes |
| Numbness & paresthesia in the same distribution |
| Straight leg raising (SLR) test induces more leg pain |
| Localized neurology (i.e. limited to one nerve root) |

Source: Waddell (The Back pain revolution, 1998)[71]

ing may only be indicated at this stage if there are indications or 'red flags' that the sciatica may be caused by underlying pathologies (infections, malignancies) other than disk herniation.

Diagnostic imaging may also be indicated in patients with severe symptoms who fail to respond to a period of 6-8 weeks of conservative care. In these cases surgery might be considered and imaging is used to identify if a herniated disk and nerve root compression indeed is present, and what its exact localisation and size is. It is very important for the decision to operate or not that the clinical findings and symptoms of the patient correspond well with the imaging findings. This is especially relevant because disk herniations identified with CT and/or MRI are highly prevalent (varying from 20 %-36 %) in asymptomatic people not having sciatica at all[53;54]. It is also true that in many people with clinical symptoms of sciatica no lumbar disk herniations are present on imaging scans[55;56]. At present, there is no clear advantage of one type of diagnostic imaging method compared to others. Although some authors favor MRI above other imaging techniques because of the higher radiation dose of CT and/or the better performance of MRI with visualising soft tissues[57;58], there is evidence that CT and MRI both are equally accurate for diagnosing lumbar disk herniation[59]. The use of X-rays for diagnosing lumbar disk herniation is not recommended because X-rays are not able to visualise the disk[59].

***What is the prognosis?***

In general, the clinical course of an episode of acute sciatica is favourable and most pain and related disability will resolve within a couple of weeks. For example, in a randomized trial evaluating NSAIDs versus placebo in patients with acute sciatica in primary care 60 % of all patients recovered within a period of 3 months and 70 % within 12 months[3]. Improvement rates of patients with acute sciatica included in placebo groups in randomized trials evaluating non-surgical interventions indicate that about 50 % of the patients report 'improvement' within 10 days and about 75 % report improvement after a period of 4 weeks[2]. These figures show that in the majority of patients the

| **Table 3**. Evidence of conservative treatments for sciatica | |
|---|---|
| *Beneficial* | |
| *Trade off* | Bed rest |
| Likely to be beneficial | Advice to stay active (in CR bedrest) |
| *Unknown effectiveness* | Analgesics/NSAIDs<br>Acupuncture<br>Epidural steroid injections<br>Spinal manipulation<br>Traction therapy<br>Physical therapy<br>Behavioral treatment Multidisciplinary treatment |
| *Unlikely to be beneficial* | |
| *Ineffective or harmful* | |

prognosis is good, but at the same time a substantial proportion (up to 30 %) continues to suffer from their complaints after a period of one year and longer.[2;3]

***What is the efficacy of conservative treatments for sciatica?***

Conservative treatment is primarily aimed at pain reduction, either by pain medication or by reducing pressure on the nerve root. A recent systematic review found that the available conservative treatments do not clearly improve the natural course of sciatica in most of the patients nor do they reduce symptoms[60]. Adequately informing patients about the causes and expected prognosis of sciatica may be regarded as an important part of the management strategy. However, patient-education has not specifically been investigated in RCTs in patients with sciatica.

Table 3 summarizes the evidence of effectiveness of commonly available conservative treatments for sciatica, including injection therapy. For most of the available interventions strong evidence is lacking. The contrast of bedrest versus advice on staying active does not show large differences in effect regarding pain and functional status[61]. Because of this finding bedrest, which for a long period has been the mainstay of treatment of sciatica, is not widely recommended anymore[62;63]. Analgesics, NSAIDs and muscle relaxants do not clearly seem to be more effective in reducing symptoms than placebo. Evidence is lacking for opioids and various compound medications. A previous systematic review also reported that there was no evidence that traction, NSAIDs, intramuscular steroids, and tizanidine are superior to placebo[2]. This review suggested that epidural steroid injection might be effective in patients with acute sciatica. However, a more recent systematic review including a larger number of randomised trials reported that there was no evidence of positive short effects of corticosteroid injections and that the long term effects were un-

***A patient's perspective (A)***

After an episode of lumbago during a vacation, I continuously had low back pain and tingling feet for about 9 months. Then suddenly my right foot started to hurt badly and after a while the pain became so severe that I was unable to leave my house. The specialist ordered an MRI scan and it revealed a large lumbar disk herniation. Since it only got worse after that, I decided to have surgery.

After the operation, I recovered quickly and the back pain and leg pain were completely gone. I soon was able to go back to work and rebuild my social life. Unfortunately, after a couple of months the low back pain and the other symptoms returned, although not as severe as before surgery. A new MRI scan now revealed two small disk herniations and two bad intervertebral disks. The specialist told me that it was too early for a second operation.

Now it is unclear to me what the doctor can do about it and I don't even know which measures I can take myself. The constant back and leg pain are greatly interfering with my work and my social life. I sometimes feel like an elderly person because of my physical limitations. I try to stay positive, but it is hard to cope with the uncertainty.

*Ms P., aged 32 years, Rotterdam*

known[60]. The same systematic review reported that active physical therapy (exercises) appeared not to be better compared with inactive (bedrest) treatment and other conservative treatments such as traction, manipulation, hotpacks or a corset)[60].

***What is the role of surgical procedures in patients with sciatica?***

Surgical intervention is focused on removal of disk herniation and eventually part of the disk or be directed at foraminal stenosis with the purpose of eliminating the suspected cause of the sciatica. The treatment is directed at easing the leg pain and corresponding symptoms and not directly at reducing the accompanying back pain. There is consensus that a cauda equina syndrome is an absolute indication for immediate surgical intervention. For unilateral sciatica the decision for surgery is elective. Until recently there was only one relatively old randomised trial available comparing surgical intervention versus conservative treatment for patients with sciatica[40]. This study showed that surgical intervention had better results after one year, while after 4 and 10 years of follow up there were no significant differences[40].

The Cochrane review summarized the available randomised clinical trials evaluating disk surgery and chemonucleolyses[64]. Chemonucleolyses concerns injection with the enzyme chymopapain in the discus with the purpose of shrinking the nucleus pulposus. They reported better results of disk surgery compared to chemonucleolyses (in patients with severe sciatica of relatively long duration). Chemonucleolyses was more effective than placebo. So, indirectly they suggested disk surgery to be more effective than placebo also. Based on data from three trials the authors concluded that there is considerable evidence that surgical diskectomy provides ef-

fective clinical relief for carefully selected patients with sciatica due to lumbar disk prolapse that fails to resolve with conservative management. A recently published review came to the same conclusion[65]. The Cochrane review further concluded that the long term effects of surgical intervention are unclear and that there also is a lack of evidence on the optimal timing of surgery[64].

***Recent RCTs not yet included in systematic reviews***

Two additional RCTs have been published comparing disk surgery versus conservative treatment. One trial (n=56) compared miscrodiskectonomy with conservative treatment in patients with 6 to 12 weeks of sciatica[66]. Overall no significant differences were found regarding leg pain, back pain, subjective disability over a two-year follow-up period. However, patients in the diskectomy group initially seemed to improve more rapidly regarding leg pain. The large SPORT randomised trial and related observational cohort study was conducted in the USA[48;49]. Patients with at least 6 weeks of sciatica with confirmed disk herniation were invited for either participation in a randomized trial or in an observational cohort study. Patients in the trial were randomised to disk surgery or conservative care. Patients in the cohort study decided themselves to receive disk surgery or conservative care based on their preference. The randomised trial (n=501) showed that both treatment groups improved substantially over a two-year period for all primary and secondary outcome measures. There were small differences in favor of the surgery group, but these differences were not statistically significant for the primary outcome measures. Remarkably, only 50 % of the patients randomised to the surgery group actually received surgery within 3 months after inclusion. At the same time 30 % randomized to conservative care received surgery within this 3-month period[67]. After 2 years follow-up 45 % of the conservative group underwent surgery versus 60 % in the surgery group[49].

The observational cohort included 743 patients. Both groups improved substantially over time, but the surgery group showed significantly better results regarding pain and function in comparison with the patients receiving conservative treatment. The authors suggest that these findings should be interpreted with caution, because of potential confounding by indication and by the self-reported nature of the outcome measures[48].

The results indicate that both conservative treatment and disk surgery are relevant treatment options for patients with sciatica of at least 6 weeks duration. Surgical intervention may provide some quicker relieve of symptoms compared to conservative treatment, but there are no large differences in success rate after one to two years follow-up. Patients (and doctors) may thus weigh the benefits and harms of both options in order to make their individual choices. This is especially relevant since the preference of patients for a certain type of treatment may have a direct positive influence on the magnitude of the treatment effect.

**Table 4.** Summary of recommendations of the clinical guideline for diagnosis and treatment of sciatica of the Dutch College of General Practice[63].

| **Summary of recommendations for diagnosis of sciatica:** |
|---|
| • Check 'red flags' for malignancies, osteoporotic fractures, radiculitis and cauda-equina syndrome<br>• History taking for determining localization, severity , loss of strength, sensibility disorders, duration, course, influence of coughing, rest or movement, and consequences for daily acitivities.<br>• Physical examination: neurological testing: straight leg raising test (SLR)/Laseque sign<br>• In case of leg pain according to dermatomal pattern, positive SLR, loss of strength or sensibility disorders further investigate: reflexes (Achilles/knee tendon); sensibility of lateral and medial sides of feet and toes, strength of big toe during extension, walking on toes and heel (left-right differences), crossed Laseques sign.<br>• Imaging or laboratory diagnostics are only indicated in red flag conditions but are not useful in cases of (suspected) disk herniation |
| **Summary of recommendations for treatment of sciatica:** |
| • Explain cause of the symptoms and reassure patients (symptoms usually diminish over time without specific measures)<br>• Advise to stay active and continue daily activities; a few hours of bedrest may provide some symptomatic relief but does not improve a faster recovery<br>• Prescribe medication if necessary (according to 4 steps) 1) paracetamol, 2) NSAIDs, 3) Tramadol; or paracetamol/NSAID in combination with codeine, 4) morfine<br>• Refer to neurosurgeon immediately in case of cauda-equina syndrome or acute severe paresis or progressive paresis (within a few days)<br>• Refer to neurologist, neurosurgeon or orthopedic surgeon to consider surgery in cases of intractable radicular pain (not responding to morfin) or if pain and suffering do not dimish after 6-8 weeks of conservative treatment . (note: in other countries referrals to rheumatologist or physiatrist are more common due to local circumstances) |

***What are the recommendations in clinical guidelines?***

Although in many countries there are clinical guidelines available for the management of non-specific low back pain this is not the case for sciatica[68]. Table 4 shows the recommendations from the recently issued clinical guidelines for sciatica (lumbosacral radicular syndrome of the Dutch College of General Practice[63]. After excluding specific pathologies based on red flags the diagnosis is made on the basis of history taking and physical examination. Initial treatment is conservative, with a strong focus on patient-education, advice to staying active and continuing daily activities and adequate pain treatment. In this phase there is no role for imaging. Referral to a medical specialised, e.g. neurologist, rheumatologist, spine surgeon is indicated in patients who do not improve their symptoms after conservative treatment for a period of at least 6-8 weeks. In these referred cases surgery may be considered. Immediate referral is indicated in cases with a cauda equina syndrome. Acute severe paresis or progressive paresis are also reasons for referral (within a few days).

***A patient's perspective (B)***

My complaints started about 4 months ago with pain in the lower back. Soon hereafter the pain radiated into my legs for which I went to my general practitioner. His analysis was no herniated disk. A muscle relaxant in combination with referral to a physiotherapist would reduce the symptoms. Three weeks of physiotherapy followed by several treatments by a chiropractor did not provide any symptom relief. In fact, the symptoms became worse. Especially during walking and standing. Laying down and cycling were much better tolerated. Additional complaints were reduced strength in the left leg, not being able to stand on the heel or toes, a cold feeling in the lower leg at the end of the day, while in the morning it felt like standing in a bunch of needles.

About 1 month ago, a neurologist diagnosed a herniated disk on the right side based on an MRI-scan that was taken. However, this could not explain the symptoms in the left leg. The symptoms in the left leg could be due to spinal stenosis. The complaints were not severe enough to recommend surgery and the neurologist told me that a substantial improvement was to be expected within a period of 3-4 months. His advice was to continue normal daily activities as much as possible. At present (one month later) I feel some improvement of my symptoms.

*Mr. J. V., aged 49 years, The Haque*

### *Promising developments*

More evidence based information has become available regarding the efficacy of surgical versus conservative care for patient with sciatica. Important knowledge is the initial finding that in the long run (after 1-2 years follow-up) there are no important differences in effect between these two distinct approaches. Although it must be stressed that there is only limited evidence available on long term effects of either conservative or surgical interventions. In addition, part of this finding may be explained because patients who initially receive conservative care undergo disk surgery at a later stadium. In all available studies it appears that fortunately a substantial part of the patients improve over time. This holds true for patients receiving surgery as well as patients receiving conservative treatment. Patients receiving disk surgery are more likely to get quicker relieve of their leg symptoms compared to patients receiving conservative care. After an initial period of 6-8 weeks without improvement of symptoms patients may thus opt for disk surgery to get quicker relieve of their leg pain. Patients who are hesitant regarding surgery and who can bear the severity of their symptoms may also opt for continued conservative care. Patient preference is therefore an important feature in this decision proces.

The last years have shown a switch in the management of sciatica from more passive treatments, including bed rest towards a more active approach and the advice to patients to continue their daily activities as much as possible.

*Future research*

Further knowledge is desirable regarding the importance of clinical signs and symptoms for the prognosis of sciatica and the response to treatment. This includes the value of size and location of the disk herniation, (visible) nerve root compression, sequestration and the results of history taking and physical /neurological examination. Subgroup analysis in the Finnish trial showed that diskectomy was superior to conservative treatment in cases with herniation at L4-L5[69]. For many of the available conservative treatments there is no strong evidence for or against their efficacy. Much progress can be achieved here. Questions exist regarding the efficacy of pain medication for sciatica, the value of physical therapy and of patient-education and counseling. No trials have yet evaluated the effectiveness of behavioral treatment and multidisciplinary treatment programs.

TNF-alfa has been identified in animal and human studies to be one of the chemical factors involved in the etiology of sciatica[67;69] The first randomized trial evaluating TNF-alfa antagonist in patient with sciatica did not find a positive result[43] but further studies are warranted.

*Summary points:*

- Most patients with acute sciatica have a favorable prognosis, but about 20-30 % has persisting complaints after 1-2 years
- The diagnosis is based on history taking and physical examination
- Only in patients with red flags conditions or if disk surgery is considered imaging is indicated.
- Passive (bedrest) treatments have recently been replaced with more active treatment approaches.
- There is consensus that initial treatment is conservative for about 6-8 weeks.
- Recent evidence suggest that disk surgery may provide quicker relief of leg pain compared to conservative care, but after one-two years initial evidence suggests that there are no clear differences.
- Apart from the cauda equina syndrome, patient preference for or against surgrey may play an important role in the treatment decision.
- Further studies are needed investigating the optimal timing of surgery and the efficacy of the majority of conservative interventions that are commonly used for sciatica.