

Optimal Duration of Conservative Management Prior to Surgery for Cervical and Lumbar Radiculopathy: A Literature Review

Vincent J. Alentado^{1,2} Daniel Lubelski^{1,3} Michael P. Steinmetz^{2,4} Edward C. Benzel^{1,3}
Thomas E. Mroz^{1,3}

¹ Cleveland Clinic Center for Spine Health, Departments of Orthopaedic and Neurological Surgery, Cleveland Clinic, Cleveland, Ohio, United States

² Case Western Reserve University School of Medicine, Cleveland, Ohio, United States

³ Cleveland Clinic Lerner College of Medicine, Cleveland, Ohio, United States

⁴ Department of Neurosciences, MetroHealth Medical Center, Cleveland, Ohio, United States

Address for correspondence Thomas E. Mroz, MD, Departments of Orthopaedic and Neurological Surgery, Center for Spine Health, The Cleveland Clinic, 9500 Euclid Avenue, S-40, Cleveland, OH 44195, United States (e-mail: mroztc@ccf.org).

Global Spine J 2014;4:279–286.

Abstract

Study Design Literature review.

Objective Since the 1970s, spine surgeons have commonly required 6 weeks of failed conservative treatment prior to considering surgical intervention for various spinal pathologies. It is unclear, however, if this standard has been validated in the literature. The authors review the natural history, outcomes, and cost-effectiveness studies relating to the current standard of 6 weeks of nonoperative care prior to surgery for patients with spinal pathologies.

Methods A systematic Medline search from 1953 to 2013 was performed to identify natural history, outcomes, and cost-effectiveness studies relating to the optimal period of conservative management prior to surgical intervention for both cervical and lumbar radiculopathy. Demographic information, operative indications, and clinical outcomes are reviewed for each study.

Results A total of 5,719 studies were identified; of these, 13 studies were selected for inclusion. Natural history studies demonstrated that 88% of patients with cervical radiculopathy and 70% of patients with lumbar radiculopathy showed improvement within 4 weeks following onset of symptoms. Outcomes and cost-effectiveness studies supported surgical intervention within 8 weeks of symptom onset for both cervical and lumbar radiculopathy.

Conclusions There are limited studies supporting any optimal duration of conservative treatment prior to surgery for cervical and lumbar radiculopathy. Therefore, evidence-based conclusions cannot be made. Based on the available literature, we suggest that an optimal timing for surgery following cervical radiculopathy is within 8 weeks of onset of symptoms. A shorter period of 4 weeks may be appropriate based on natural history studies. Additionally, we found that optimal timing for surgery following lumbar radiculopathy is between 4 and 8 weeks. A prospective study is needed to explicitly identify the optimal duration of conservative therapy prior to surgery so that costs may be reduced and patient outcomes improved.

Keywords

- ▶ cervical radiculopathy
- ▶ lumbar radiculopathy
- ▶ natural history
- ▶ conservative management
- ▶ surgical outcomes
- ▶ preoperative guidelines

received
April 25, 2014
accepted after revision
June 23, 2014
published online
August 28, 2014

© 2014 Georg Thieme Verlag KG
Stuttgart · New York

DOI <http://dx.doi.org/10.1055/s-0034-1387807>.
ISSN 2192-5682.

Introduction

Since the 1970s, spine surgeons have commonly required 6 weeks of failed conservative treatment prior to surgical intervention for various spinal pathologies.¹ However, it is unclear whether this standard has been validated in the literature. We reviewed two common spinal pathologies, namely cervical and lumbar radiculopathy, to determine if the current literature supports the standard practice of waiting at least 6 weeks prior to operating. Few studies have looked at these two topics, and all of them are insufficient to validate the standard. The literature is currently unclear as to why 6 weeks of conservative management prior to surgery has become the standard of care for spine surgeons.

Due to the limited evidence and recent controversy regarding the necessity of 6 weeks of conservative management prior to surgery, we reviewed studies investigating natural history, outcomes, and cost-effectiveness to identify if possible the optimal duration of conservative treatment.

Methods

A Medline review of the English-language literature between 1953 and 2013 was performed to provide a comprehensive review of studies of natural history, outcomes, and cost-effectiveness related to the recommendation of 6 weeks of conservative therapy prior to spinal surgery. The terms used for these inquiries included “conservative treatment AND spine surgery,” “conservative treatment AND spine surgery AND six weeks,” “natural history AND radiculopathy,” “natural history AND cervical radiculopathy,” “natural history AND lumbar disk herniation,” “prognosis AND cervical radiculopathy,” “prognosis AND lumbar disk herniation,” “prognosis AND cervical radiculopathy AND surgery,” “prognosis AND lumbar disk herniation AND surgery,” “cervical radiculopathy AND surgical outcomes,” “lumbar disk herniation AND surgical outcomes,” “cost effectiveness AND cervical radiculopathy,” and “cost effectiveness AND lumbar disk herniation.” Reference lists of key articles were also systematically checked for further studies on the history of the 6-week recommendation as well as the other study types relating to this review. All articles that outlined the natural histories, outcomes, and cost-effectiveness of cervical radiculopathy and lumbar disk herniation with radiculopathy were identified. Natural history studies of the two pathologies were included to see if natural histories support the recommendation of 6 weeks of conservative management.

A total number of 2,204 conservative treatment studies, 261 natural history studies, 2,735 prognosis studies, 430 surgical outcome studies, and 89 cost-effectiveness studies for a total of 5,719 studies were identified. The studies that provided natural histories based on consecutive computed tomography of disk herniations were excluded due to disagreement in the literature as to how imaging relates to symptoms. Studies looking at natural histories, outcomes, or cost-effectiveness over periods of 6 months or greater were excluded, as this time does not fall within the current guidelines of 6 to 12 weeks of conservative management. Case

reports, surgical series with fewer than five patients, literature reviews, basic science, and animal studies were all also excluded. After exclusion, 13 studies remained. Each study was then reviewed and analyzed for clinical diagnosis, demographic information, method of obtaining results, operative indication, and clinical outcomes.

Results

The natural histories of both cervical radiculopathy and lumbar disk herniation with radiculopathy are presented to help identify the duration within which patients tend to improve without surgery. Patient outcomes and cost-effectiveness studies based on duration of conservative treatment or symptoms prior to surgery are also reviewed to identify the optimal length of time for conservative management.

Cervical Radiculopathy

Cervical radiculopathy is a common spinal disorder with an annual incidence of 107.3 per 100,000 for men and 63.5 per 100,000 for women.² It is sometimes treated surgically following 6 weeks of conservative treatment.³ Studies relating to the natural history of cervical radiculopathy as well as patient outcomes and cost-effectiveness of surgery were examined.

Only one study reviewed optimal duration of conservative management prior to surgery based on the natural history of cervical radiculopathy. Spurling and Segerberg prospectively investigated 110 patients with cervical radiculopathy who were treated conservatively with 7 to 10 days of bed rest and traction and found that 88% (97/110) had symptom improvement based on subjective patient and investigator perception within the first 4 weeks.⁴ This study suggested that a large number of patients may experience relief in symptoms within the first month of conservative management, but more studies investigating the natural history of patients at other periods within 4 weeks are needed before evidence-based conclusions can be made.

Studies that analyzed surgical outcomes based on duration of time before surgery were reviewed to find the optimal time prior to surgery for cervical radiculopathy. Two studies consisting of 279 patients were identified. Räsänen et al prospectively studied 169 patients who were surgically treated for cervical radiculopathy.⁵ The authors determined that the 88 patients (52%) who waited less than 60 days before surgical intervention showed greater improvement in the 15 dimensional health-related quality of life (HRQOL) score compared with the 81 patients (48%) who waited more than 60 days before surgery (0.05 compared with 0.02). The group who waited less than 60 days also gained higher quality-adjusted life years (QALYs; 1.68 compared with 0.70). Spurling and Segerberg followed 110 patients, 12% (13/110) of whom were referred to surgery within the first month of conservative treatment due to a lack of perceived symptom improvement.⁴ None of the individuals who had symptom improvement within the first month went on to require surgery. Data from Spurling and Segerberg suggest that if symptoms of cervical radiculopathy improve within 1 month, it is unlikely that

Table 1 Improvements based on natural histories for lumbar disk herniation with radiculopathy

| | | | Patients who improved at various times following onset of symptoms | | | |
|---------------------------------|-------------|----------------------------------|--|------|-------|-------|
| Author | Sample size | Measures assessed | 2 wk | 4 wk | 12 wk | 24 wk |
| Vroomen et al 1999 ⁷ | 183 | Patient perception | 65–70% | | 87% | |
| Weber et al 1993 ⁸ | 205 | VAS and Roland's functional test | | 70% | | |
| Hakelius 1970 ⁹ | 38 | Patient perception | | | | 88% |

Abbreviation: VAS, visual analog scale.

patients will require surgery. Together, the two aforementioned studies support an optimal duration of 4 to 8 weeks of conservative management prior to surgical intervention; however, both studies do little to determine the optimal duration for nonoperative care for patients with cervical radiculopathy.

The study by Räsänen and colleagues also investigated direct costs of surgery for cervical radiculopathy.⁵ The authors found that the cost per QALY gained for patients who underwent surgery within 60 days (88/169 patients) was €1992, whereas in those cases where surgery was delayed (81/169 patients), the cost per QALY was €4836, again illustrating the benefit of performing surgery within 8 weeks following onset of symptoms for cervical radiculopathy.

Lumbar Disk Herniation with Radiculopathy

Lumbar disk herniation with radiculopathy is a common spinal disorder with an annual incidence of 1.44 per 100 individuals and an annual prevalence of 2.21%.⁶ Similarly to cervical radiculopathy, it is sometimes treated surgically following 6 weeks of conservative treatment. Studies relating to the natural history, surgical outcomes, and surgical cost-effectiveness of lumbar disk herniation with radiculopathy were examined.

Natural History

Three studies consisting of 426 patients were identified investigating the natural history of lumbar disk herniation with radiculopathy. Vroomen et al prospectively studied 183 patients with sciatica who were randomly assigned to bed rest or normal activities.⁷ The authors found that 70% (64/92) of patients assigned to bed rest and 65% (59/91) of patients assigned to normal activities improved within 2 weeks and that 87% (80/92 patients and 79/91 patients, respectively) of both groups improved by 12 weeks. Improvements were based on subjective patient and investigator perception, and the two different nonoperative treatment techniques failed to yield statistically significant differences. Weber and colleagues prospectively studied 208 patients with acute sciatica who were treated with 1 week of bed rest and found that 70% (146/208) of patients had symptom improvement (as measured by visual analog scale and Roland's functional tests) within 4 weeks.⁸ Hakelius assessed 38 patients with sciatica who were treated conservatively with bed rest, a corset, and physical therapy.⁹ At 24 weeks, the author estab-

lished that 88% (33/38) of the patients were symptom-free based on patient perception (► **Table 1**).

These three studies varied considerably in terms of design, reporting, and execution. Given this heterogeneity, direct comparison of data across studies was not possible. However, based on the studies, ~70% of patients treated conservatively had improvement at both 2 weeks and 4 weeks following onset of symptoms. By 12 weeks, ~87% of patients improved, and between 12 weeks and 24 weeks, the rate of improvement among patients stabilized at ~87 to 88%.

This aforementioned timeline correlates well with the randomized control study by Weber.¹⁰ The author reported that 3 months was sufficient to decide against surgery in 80% of the conservatively treated patients who had good and fair results (based on a survey of patient satisfaction). However, Weber also noted that the conservatively treated patients who did not improve during this time would spend this period in pain, with possible psychosocial consequences. The author believed that data regarding prognostic indicators such as demographic information and physical exam findings could quantify the likelihood of a patient failing conservative treatment and could therefore help to determine the appropriateness of earlier surgical intervention. However, the author did not find any significant differences among 24 variables studied.

Based on the available natural history studies, a nonoperative period of 2 to 12 weeks following the onset of symptoms is reasonable prior to surgical intervention.

Outcomes

Six studies consisting of 808 patients investigated optimal duration of conservative management prior to surgery based on patient outcomes for patients with lumbar disk herniation with radiculopathy (► **Table 2**). Rothoerl et al prospectively studied 219 consecutive patients who underwent surgery for lumbar disk herniation and radiculopathy.¹¹ The authors found that patients waiting more than 60 days prior to surgical intervention had significantly worse functional Prolo Scale scores than patients waiting 60 days or less. Patients who had surgery within the first 30 days of developing symptoms had better Prolo scale scores, but this was not a statistically significant effect ($p < 0.139$). Hurme and Alaranta prospectively evaluated 235 surgically treated patients and found that patients who were operated on before 8 weeks' duration of sciatica reported a greater improvement in indices of pain, activities of daily living (both modified from

Table 2 Optimal interval for surgery following lumbar disk herniation with radiculopathy

| Author | Study type | Sample size | Recommended period prior to surgery | Rationale | Measures assessed |
|---------------------------------------|-----------------------------------|-------------|---|--|---|
| Rothoerl et al 2002 ¹¹ | Prospective study | 219 | <60 d | Patients treated surgically following more than 60 d of symptoms were found to have statistically significantly worse outcomes | Prolo Scale scores |
| Hurme and Alaranta 1987 ¹² | Prospective study | 235 | <60 d | Perceived outcomes were statistically better in patients who were operated on before 60 d duration of disabling sciatica | Indices of pain and ADLs as well as combination index for pain and working capacity |
| Räsänen et al 2006 ⁵ | Prospective cost-utility analysis | 101 | <60 d | HRQOL scores and QALYs were greater and cost per QALY was less in patients in who had surgery within 60 d | 15-dimensional HRQOL scores |
| Fisher et al 2004 ¹³ | Prospective study | 82 | <3 mo | HRQOL scores were higher in patients who had surgery within 3 mo when compared with other intervals | HRQOL scores based on NASS instruments and SF-36 |
| Akagi et al 2010 ¹⁴ | Retrospective study | 46 | None given | No differences in pain or functional status for patients operated on before or after 3 mo of symptoms | Japanese Association Back Pain Evaluation Questionnaire |
| Peul et al 2007 ¹⁵ | RCT | 283 | Patient's decision based on length of recovery period | At 1-y follow-up, there was no significant difference between groups in mean scores for any outcome measurement | Patient survey |

Abbreviations: ADLs, activities of daily living; HRQOL, health-related quality of life; NASS, North American Spine Society; RCT, randomized controlled trial; SF-36, short form-36.

the indices of Bergquist-Ullman and Larson), and a combination index for pain and working capacity compared with those operated on after 8 weeks.¹² Räsänen and colleagues prospectively studied 101 patients who were surgically treated for lumbar radiculopathy. In the 43 patients who underwent surgery within 60 days following the onset of their symptoms, HRQOL scores were greater (0.08 compared with 0.05), QALYs were greater (2.50 compared with 1.64), and cost per QALY was less (€1351 compared with €2182) compared with the 58 patients who waited longer than 60 days for surgery.⁵ Fisher et al prospectively studied 82 patients with lumbar disk herniation with radiculopathy and found that patients who had surgery within 3 months of symptom onset had better HRQOL scores (based on the North American Spine Society instruments Neurogenic Symptoms Score and Pain/Disability Score and Short Form-36) compared with patients who were operated on later after symptom onset (following 3.1 to 6 months, 6.1 to 9 months, or 9.1 to 12 months).¹³ However, Akagi and colleagues retrospectively studied 46 patients who had surgery for lumbar disk herniation before or after 3 months of symptom duration and found that there were no differences in pain or functional status based on the Japanese Orthopaedic Association Back Pain Evaluation Questionnaire.¹⁴ The conservative treatments used prior to surgery included medication, a corset, back muscle exercises, and nerve root or epidural block with 1% lidocaine and dexamethasone (2 to 4 mg). If leg pain was unbearable or persistent, surgery was performed. Peul et al prospectively studied outcomes in 125 patients who were randomly assigned to undergo surgery either 2 weeks or 18 weeks following a mandatory period of 6 to 12 weeks of preoperative conservative management such that patients in the early surgical group had surgery following 8 to 14 weeks of conservative management and patients in the later surgical group had surgery following 24 to 30 weeks of conservative management.¹⁵ Conservative therapy consisted of analgesics and physical therapy based on the needs of the patient. During the first year, the early surgery group had faster recovery times compared with the later surgery group based on results from a survey sent to patients.

The studies by Rothoerl et al,¹¹ Hurme and Alaranta,¹² and Räsänen et al⁵ recommended surgery within 60 days following the onset of symptoms. Data from the study by Rothoerl et al suggested that outcomes may be even better if surgery is performed prior to 30 days following onset of symptoms.

There are two anatomically distinct types of lumbar disk herniation, contained and noncontained. Two studies consisting of 669 patients investigated optimal duration of symptoms prior to surgery for patients with contained versus noncontained lumbar disk herniation. Folman and colleagues retrospectively studied 63 patients with surgery for lumbar disk herniation.¹⁶ They found that patients with noncontained herniations (29/63 patients) with a preoperative symptom duration of 6 weeks or less (13/29 patients) showed a greater decrease in radicular pain according to the visual analog score (8.3 versus 6.5) and better functional outcomes according to patient survey (96.4% good or fair versus 74.3% good or fair) compared with patients who had

surgery 6 to 12 weeks following onset of symptoms (16/29 patients). Patients with contained lumbar disk herniations all had a history of symptom length greater than 12 weeks prior to surgery. Nakagawa and colleagues retrospectively studied 606 patient records over an 11-year interval in which the length of in-hospital conservative treatment prior to surgery was extended.¹⁷ Conservative treatment consisted of anti-inflammatory medication and bed rest, and surgery was performed if a patient had intolerable pain. At the beginning of the period investigated, patients were operated on as soon as possible, but this interval was extended several weeks during the 11-year interval under investigation. The authors found that surgery rates for noncontained lumbar disk herniation showed a statistically significant decline, especially within the first 4 weeks, whereas surgery rates for contained lumbar disk herniation did not change significantly. This led the authors to conclude that with noncontained lumbar disk herniation, conservative treatment should be longer than 4 weeks, whereas with contained lumbar disk herniation, conservative therapy should be less than 1 month.

These two studies indicated that surgery should be performed between 4 and 6 weeks of symptom duration for noncontained lumbar disk herniations but within 4 weeks for contained lumbar disk herniations. Jönsson and Strömqvist prospectively studied 200 disk herniations that were classified as either contained or noncontained.¹⁸ The authors reported that patients with quick onset of severe pain typically had noncontained lumbar disk herniations, which is likely why patients with contained lumbar disk herniations had a longer duration of symptoms prior to presentation in the Folman et al study.¹⁶

In addition to the previously mentioned studies recommending various lengths of conservative treatment prior to surgery, Vroomen et al found several preoperative patient characteristics that predicted success of conservative management for lumbar radiculopathy.¹⁹ The authors reported that decreased pain at night, symptom improvement by first office visit, decreased pain with applied pressure, and a greater body mass index were all predictors of positive outcomes at 2 weeks following conservative treatment. In contrast, duration of disease longer than 30 days, a positive straight leg raise, and a positive reversed straight leg raise were indicative of a poor prognosis at 3 months following conservative treatment. These prognostic indicators may be useful in assessing the likelihood of patients improving following conservative treatment.

These prognostic factors are useful given the previously mentioned natural history studies that suggest that most patients improve within 2 weeks and another subset of patients improve at 4 to 12 weeks. For example, these data suggest that it would be appropriate to operate on patients with a positive straight leg raise at 2 weeks as even with 10 additional weeks of conservative therapy they have a low likelihood of improving. However, these data are insufficient to warrant early surgical intervention by themselves, as none of the outcomes studies examines surgical intervention within this period.

Cost-Effectiveness

Two studies consisting of 384 patients investigated the cost-effectiveness of lumbar disk herniation with radiculopathy relating to optimal duration of conservative management prior to surgery. Van den Hout et al compared 6 months of prolonged conservative care versus surgery following 6 to 12 weeks of conservative treatment in 283 patients.²⁰ Conservative treatments were limited to analgesics unless the patient feared the possibility of the symptoms worsening, in which case physical therapy was prescribed. The authors found that early surgery resulted in \$2,832 more per patient and a cost per QALY gained of \$64,000. Costs were estimated based on diaries kept by patients to measure all direct and indirect costs including informal care and absenteeism from work. The authors concluded that the faster recovery rate from sciatica made early surgery cost-effective compared with prolonged conservative care. Räsänen et al measured direct hospital costs and found that in patients who had surgery within 60 days, the mean cost per QALY was €1351 compared with €2182 in patients who were operated on after 60 days of symptoms.⁵ Indirect costs were not included within the study.

Although Van den Hout et al identified greater costs associated with surgery relative to conservative management, they concluded that surgery was cost-effective due to the improvement in patient recovery rates and faster return to work.²⁰ The studies by Räsänen and colleagues⁵ and Van den Hout et al²⁰ both indicated that a period of conservative treatment of less than 6 to 12 weeks is more cost-effective relative to prolonged conservative treatment (i.e., greater than 6 months).

Discussion

Background

In a study examining surgical practices at one hospital between 1971 and 1977, Lunsford and colleagues stated that lateral cervical disk herniation was treated surgically only after 6 weeks of failed conservative treatment.¹ The reasons for this period, however, were not stated. A 1972 article by Murphy and Gado investigating anterior cervical discectomies similarly established a protocol requiring patients to be immobilized for 6 weeks in a collar prior to surgery.²¹ Similarly, this was not substantiated by scientific evidence.

By 1996, Saal discussed that an “arbitrary” 2- to 8-week period of conservative treatment was the standard prerequisite for considering spine surgical treatment.²² Saal outlined his own experiences regarding patient natural history and concluded that a patient with neurologic loss not improving in 6 weeks is a candidate for surgery. Two years later, in a letter to the editor, Hidalgo-Ovejero and colleagues questioned this conclusion, as there were no supporting data provided for this 6-week period.²³

Recently, there has been increasing controversy regarding the effectiveness of waiting 6 weeks before proceeding with surgery. In a 2004 survey of neurosurgeons in the Netherlands, fewer than 60% agreed that general practi-

tioners should wait 6 weeks prior to discussing surgical options with their patients with lumbar radiculopathy.²⁴ Seventeen percent believed that the onset of radicular symptoms following a lumbar disk herniation warranted surgery within 2 to 6 weeks, and 18% recommended surgery only after 6 weeks of failed conservative management.²⁴ Vader et al found disagreement between two panels of American and Swiss health experts regarding whether patients with lumbar disk herniation and radiculopathy lasting less than 6 weeks should be considered surgical candidates.²⁵

Currently, it is standard among spine surgeons, various professional societies, certifying boards, and health insurance companies that surgery for cervical and lumbar radiculopathy should be considered only after failure of at least 6 weeks of nonoperative care in patients who remain stable neurologically. In fact, three of the largest health care providers in the United States (United HealthCare, BlueCross BlueShield, and Aetna) require a minimum of 6 but up to 12 weeks of documented nonoperative treatment prior to approving surgery for patients.^{26–28}

In a study of preoperative costs before lumbar discectomy following a herniation, Daffner and colleagues found that the average costs for preoperative treatments were \$3,445 per patient, with 45% of the total charges spent on conservative treatment modalities such as injections, physical therapy, and chiropractic manipulation.²⁹ In theory, earlier surgery would decrease costs for patients who have greater likelihood of failing conservative management. However, methods to define potential failures are not well defined in the literature.

Recommendations

The identified studies indicate that the natural histories of cervical radiculopathy versus lumbar radiculopathy are different and accordingly should warrant different recommendations for nonoperative management. Although 88% of patients with cervical radiculopathy have improvement within 4 weeks following the onset of their symptoms,⁴ only 70% of patients with lumbar disk herniation and radiculopathy improve within the same period, with an additional 20% of patients improving between weeks 4 and 12.^{7,8} This indicates that surgery following a shorter duration of symptoms may be indicated for cervical radiculopathy compared with lumbar disk herniation with radiculopathy.

Despite a lack of historical data regarding the recommendation of 6 weeks of conservative management prior to surgery, evidence demonstrates improvements in patient surgical outcomes and reduced patient costs when performing surgery prior to 8 weeks of symptom duration. Räsänen and colleagues found improvements in HRQOL scores, QALYs gained, and cost per QALY gained for patients who had surgery within 60 days to treat both cervical radiculopathy and lumbar disk herniation with radiculopathy.⁵ Similarly, Hurme and Alaranta¹⁶ and Rothoerl et al¹¹ found improved outcomes in patients who underwent surgery for lumbar disk herniation with radiculopathy before 60 days of symptoms. Rothoerl et al¹¹ and Nakagawa et al¹⁷ also indicated that surgery before 4-week duration of symptoms may lead to

even better outcomes for patients, depending on the type of disk herniation found.

Overall, we found that due to the differences in the natural histories of cervical radiculopathy and lumbar disk herniation with radiculopathy, specific recommendations of conservative treatment duration should be made for individual pathologies. Furthermore, the studies by Weber¹⁰ and Vroomen et al¹⁹ suggested that differences in patient symptoms and physical exam findings may be helpful in determining the success of prolonged conservative management. However, further studies are needed to determine if early surgical intervention is beneficial for patients who are found likely to fail conservative management, as none currently exist.

None of the data presented herein support a specified length of conservative treatment before surgical intervention, as outcomes only differed based on symptom duration and not duration of conservative management prior to surgery. Because the natural history of lumbar radiculopathy does not differ based on whether the patient continues with regular daily activities or undergoes conservative treatment,⁷ this approach supports quantifying duration of symptoms and not duration of conservative management.

Based on the available data, surgery should be performed within 8 weeks of onset of symptoms for patients presenting with cervical radiculopathy. A period of 4 weeks may lead to even better outcomes,⁴ but additional investigations assessing patient outcomes within this period are needed. Similarly, surgery for lumbar disk herniation with radiculopathy should be performed within 8 weeks as well. However, the natural history study by Weber et al⁸ and the outcomes study by Rothoerl et al¹¹ and Nakagawa et al¹⁷ support earlier surgical intervention (within 4 weeks of symptom onset).

Based on the literature discussed in this review, the standard interval of 6 weeks of conservative management prior to surgical intervention of cervical and lumbar radiculopathies is somewhat arbitrary. Of the studies that form the foundation of this standard, there is substantial heterogeneity in the study design and execution, reporting, outcomes measures utilized, as well as modalities of “conservative” care implemented. Although this review questions the scientific rationale for this standard, it also provides a trajectory for necessary future research to more clearly define the natural history of cervical and lumbar radiculopathy, the most efficacious nonoperative treatment(s), and the most cost-effective approach(es). Such efforts will either validate and invalidate the current standard, but they may also identify more efficacious and cost-effective treatments for specific patient cohorts. It is quite likely that a “standard” interval of nonoperative care will not pertain to or fit all patients with these common disease processes and that care will need to be tailored to specific, yet currently ill-defined, patient characteristics.

There were several limitations with the present review. The natural history studies included were heterogeneous in their design, including differences in follow-up time and analyses of patient improvement. Accordingly, the concept of “improvement” varied between studies, and consequently, the rate of improvement varied as well. However, the natural

history data found did seem to generate a consistent timeline of improvement over the weeks following onset of symptoms. Finally, the lack of large, well-designed, prospective studies comparing various periods of conservative management prior to surgery with regards to outcomes and cost-effectiveness limit the ability to make a definitive, evidence-based conclusion based on the data presented.

Conclusions

Limited evidence exists on the optimal duration of conservative treatment prior to surgery, and therefore evidence-based conclusions on this topic cannot be made. Small, preliminary studies suggest that the optimal timing for surgery following cervical radiculopathy is within 8 weeks following onset of symptoms, but due to the high percentage of patients who exhibit relief by 4 weeks, a shorter period may be warranted. These studies also suggest that surgery for lumbar disk herniation with radiculopathy should be performed within 4 to 8 weeks for lumbar disk herniation with radiculopathy. A prospective study is needed to determine how costs and outcomes differ between patients conservatively treated for different durations. Identifying the optimal duration of conservative therapy prior to surgery will help reduce unnecessary costs for early surgeries for pathologies that would have improved with conservative management. It will also help limit the needless physical distress and cost among patients who would have benefited from earlier surgery. With well-designed, prospective studies, these timelines can be elucidated, leading to better patient outcomes and lower health-care costs.

Disclosures

Vincent J. Alentado, none

Daniel Lubelski, none

Michael P. Steinmetz, Consultancy: Biomet Spine, Depuy-Synthes

Edward C. Benzel, Consultancy: OrthoMEMs, AxioMED; Royalties: DePuy; Stock/stock options: OrthoMEMs, AxioMED

Thomas E. Mroz, Board membership: AOSpine; Consultancy: Ceramtec; Stock/stock options: PearlDiver, Inc.

References

- 1 Lunsford LD, Bissonette DJ, Jannetta PJ, Sheptak PE, Zorub DS. Anterior surgery for cervical disc disease. Part 1: Treatment of lateral cervical disc herniation in 253 cases. *J Neurosurg* 1980; 53(1):1-11
- 2 Radhakrishnan K, Litchy WJ, O'Fallon WM, Kurland LT. Epidemiology of cervical radiculopathy. A population-based study from Rochester, Minnesota, 1976 through 1990. *Brain* 1994;117(Pt 2): 325-335
- 3 Carette S, Fehlings MG. Clinical practice. Cervical radiculopathy. *N Engl J Med* 2005;353(4):392-399
- 4 Spurling RG, Segerberg LH. Lateral intervertebral disk lesions in the lower cervical region. *J Am Med Assoc* 1953;151(5): 354-359

- 5 Räsänen P, Ohman J, Sintonen H, et al. Cost-utility analysis of routine neurosurgical spinal surgery. *J Neurosurg Spine* 2006;5(3): 204–209
- 6 Younes M, Béjia I, Aguir Z, et al. Prevalence and risk factors of disk-related sciatica in an urban population in Tunisia. *Joint Bone Spine* 2006;73(5):538–542
- 7 Vroomen PC, de Krom MC, Wilminck JT, Kester AD, Knottnerus JA. Lack of effectiveness of bed rest for sciatica. *N Engl J Med* 1999; 340(6):418–423
- 8 Weber H, Holme I, Amlie E. The natural course of acute sciatica with nerve root symptoms in a double-blind placebo-controlled trial evaluating the effect of piroxicam. *Spine (Phila Pa 1976)* 1993; 18(11):1433–1438
- 9 Hakelius A. Prognosis in sciatica. A clinical follow-up of surgical and non-surgical treatment. *Acta Orthop Scand Suppl* 1970;129:1–76
- 10 Weber H. Lumbar disc herniation. A controlled, prospective study with ten years of observation. *Spine (Phila Pa 1976)* 1983;8(2): 131–140
- 11 Rothoerl RD, Woertgen C, Brawanski A. When should conservative treatment for lumbar disc herniation be ceased and surgery considered? *Neurosurg Rev* 2002;25(3):162–165
- 12 Hurme M, Alaranta H. Factors predicting the result of surgery for lumbar intervertebral disc herniation. *Spine (Phila Pa 1976)* 1987; 12(9):933–938
- 13 Fisher C, Noonan V, Bishop P, et al. Outcome evaluation of the operative management of lumbar disc herniation causing sciatica. *J Neurosurg* 2004;100(4, Suppl Spine):317–324
- 14 Akagi R, Aoki Y, Ikeda Y, et al. Comparison of early and late surgical intervention for lumbar disc herniation: is earlier better? *J Orthop Sci* 2010;15(3):294–298
- 15 Peul WC, van Houwelingen HC, van den Hout WB, et al; Leiden-The Hague Spine Intervention Prognostic Study Group. Surgery versus prolonged conservative treatment for sciatica. *N Engl J Med* 2007; 356(22):2245–2256
- 16 Folman Y, Shabat S, Catz A, Gepstein R. Late results of surgery for herniated lumbar disk as related to duration of preoperative symptoms and type of herniation. *Surg Neurol* 2008;70(4): 398–401, discussion 401–402
- 17 Nakagawa H, Kamimura M, Takahara K, et al. Optimal duration of conservative treatment for lumbar disc herniation depending on the type of herniation. *J Clin Neurosci* 2007;14(2):104–109
- 18 Jönsson B, Strömqvist B. Clinical appearance of contained and noncontained lumbar disc herniation. *J Spinal Disord* 1996;9(1): 32–38
- 19 Vroomen PCAJ, de Krom MCTFM, Knottnerus JA. Predicting the outcome of sciatica at short-term follow-up. *Br J Gen Pract* 2002; 52(475):119–123
- 20 van den Hout WB, Peul WC, Koes BW, Brand R, Kievit J, Thomeer RT; Leiden-The Hague Spine Intervention Prognostic Study Group. Prolonged conservative care versus early surgery in patients with sciatica from lumbar disc herniation: cost utility analysis alongside a randomised controlled trial. *BMJ* 2008;336(7657): 1351–1354
- 21 Murphy MG, Gado M. Anterior cervical discectomy without interbody bone graft. *J Neurosurg* 1972;37(1):71–74
- 22 Saal JA. Natural history and nonoperative treatment of lumbar disc herniation. *Spine (Phila Pa 1976)* 1996;21(24, Suppl): 2S–9S
- 23 Hidalgo-Ovejero AM, Garcia-Mata S, Martinez-Grande M. Natural history and nonoperative treatment of lumbar disc herniation. *Spine (Phila Pa 1976)* 1998;23(4):508–510
- 24 Luijsterburg PAJ, Verhagen AP, Braak S, Avezaat CJ, Koes BW. Do neurosurgeons subscribe to the guideline lumbosacral radicular syndrome? *Clin Neurol Neurosurg* 2004;106(4):313–317
- 25 Vader JP, Porchet F, Larequi-Lauber T, Dubois RW, Burnand B. Appropriateness of surgery for sciatica: reliability of guidelines from expert panels. *Spine (Phila Pa 1976)* 2000;25(14):1831–1836
- 26 Aetna. Clinical Policy Bulletin. Spinal Surgery: Laminectomy and Fusion; 2013. Available at: http://www.aetna.com/cpb/medical/data/700_799/0743.html
- 27 BlueCross BlueShield of North Carolina. Corporate Medical Policy; 2012. Available at: <https://www.bcbsri.com/sites/default/files/policies/LumbarFusion.pdf>
- 28 United HealthCare. Medical Policy Update Bulletin; 2012. Available at: https://www.unitedhealthcareonline.com/ccmcontent/ProviderII/UHC/en-US/Assets/ProviderStaticFiles/Provider - StaticFilesPdf/Tools%20and%20Resources/Policies%20and%20Protocols/Medical%20Policy%20Update%20Bulletins/Policy%20Update%20Bulletins/Medical_Policy_Update_Bulletin_-_March_2012.pdf
- 29 Daffner SD, Hymanson HJ, Wang JC. Cost and use of conservative management of lumbar disc herniation before surgical discectomy. *Spine J* 2010;10(6):463–468