



**Universiteit
Leiden**
The Netherlands

**Tubular discectomy for the treatment of lumbar disc herniation :
new standard or transient fashion? : Results of a double-blind
randomised controlled trial**

Arts, M.P.

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Yosemite Falls, USA

Chapter 2

Survey on sciatica among spine surgeons

Management of sciatica due to lumbar disc herniation in the Netherlands: a survey among spine surgeons

Mark P. Arts

Wilco C. Peul

Bart W. Koes

Ralph T.W.M. Thomeer

ABSTRACT

Object: Although clinical guidelines for sciatica have been developed, various aspects of lumbar disc herniation remain unclear, and daily clinical practice may vary. The authors conducted a descriptive survey among spine surgeons in the Netherlands to obtain an overview of routine management of lumbar disc herniation.

Methods: One hundred thirty-one spine surgeons were sent a questionnaire regarding various aspects of different surgical procedures. Eighty-six (70%) of the 122 who performed lumbar disc surgery provided usable questionnaires.

Results: Unilateral transflaval discectomy was the most frequently performed procedure and was expected to be the most effective, whereas percutaneous laser disc decompression was expected to be the least effective. Bilateral discectomy was expected to be associated with the most postoperative low-back pain. Recurrent disc herniation was expected to be lowest after bilateral discectomy and highest after percutaneous laser disc decompression. Complications were expected to be highest after bilateral discectomy and lowest after unilateral transflaval discectomy. Nearly half of the surgeons preferentially treated patients with 8-12 weeks of disabling leg pain. Some consensus was shown on acute surgery in patients with short-lasting drop foot and those with a cauda equina syndrome, and nonsurgical treatment in patients with long-lasting, painless drop foot. Most respondents allowed postoperative mobilization within 24 hours but advised their patients not to resume work until 8-12 weeks postoperatively.

Conclusions: Unilateral transflaval discectomy was the most frequently performed procedure. Minimally invasive techniques were expected to be less effective, with higher recurrence rates but less postoperative low-back pain. Variety was shown between surgeons in the management of patients with neurological deficit. Most responding surgeons allowed early mobilization but appeared to give conservative advise in resumption of work.

INTRODUCTION

Lumbar disc herniation is the most common cause of sciatica. Although the natural course is favorable in the majority of patients, lumbar disc surgery is frequently performed. In the Netherlands, between 10.000 and 11.000 patients undergo operations for lumbar disc herniation each year.¹ A study comparing 11 developed countries showed that the United States is the only country with a higher lumbar disc surgery rate.² Patients should be offered surgical treatment whenever they have persisting radicular leg pain despite conservative treatment.^{3,4} In clinical practice, however, the perioperative strategy and surgical technique may vary.

Since the first publication of intervertebral disc surgery by Mixter and Barr, various techniques have been developed.⁵ Using the surgical microscope, Caspar and Yasargil introduced microdiscectomy, obviating the wide exposure that was necessary with laminectomy.^{6,7} This technique has become the most common procedure worldwide. Minimally invasive techniques such as microendoscopic discectomy (MED) and percutaneous laser disc decompression (PLDD) have gained attention in recent years. The concept of minimally invasive spinal surgery comprises less tissue damage, less back pain, shorter hospitalization times, and faster resumption of work and daily activities. Its effectiveness compared with the conventional open discectomy has not yet been determined.⁸ Whether these interventions are being performed routinely in the practice of spine surgeons is not known.

Clinical guidelines for sciatica have been developed and implemented to improve the quality of health care. The vast majority of neurosurgeons in the Netherlands endorse the content of the clinical practice guidelines.^{9,10} However, various items in patients with lumbar disc herniation are still being debated. For example, the optimal timing of surgery in patients with lumbosacral radicular syndrome, cauda equina syndrome, or patients with a painless drop foot is unclear. Moreover, the daily clinical practice of postoperative care, including mobilization, physiotherapy, and restriction of work and daily activity is controversial and may show a large variation.

Because there is a relatively high rate of low-back surgery in the Netherlands, an evaluation of the surgeons' use of clinical guidelines seems appropriate. Accordingly, we conducted a survey of the management of sciatica among neurosurgeons and orthopaedic surgeons who were specialized in the spine. The aim of this survey was to obtain an overview of routinely performed surgical procedures and postoperative care of patients with sciatica due to a herniated lumbar disc. Moreover, the surgeons' expectations of various conventional and

minimally invasive techniques regarding leg pain, low-back pain, recurrent disc herniation, and complications were evaluated.

METHODS

In 2004, all 131 neurosurgical and orthopaedic members of the Dutch Spine Society were sent a questionnaire by mail. The questionnaire referred to various aspects of surgical and postsurgical management of lumbar disc herniation, as follows: 1) surgeons' characteristics-age, sex, years of clinical experience, number of lumbar discectomies performed annually; 2) standard procedure; 3) expectations for clinical results of various surgical approaches in the short term (8 weeks) and long term (2 years) regarding leg pain and low-back pain, recurrence rate, and complication rate; 4) period of conservative treatment prior to surgery; 5) timing of surgery in patients with short-lasting and long-lasting neurological deficit, with or without radicular pain; 6) timing of surgery in patients with a cauda equina syndrome; and 7) postoperative mobilization strategy-day of mobilization, physiotherapy, and resumption of work and daily activities.

The questionnaire consisted of 21 questions (see Appendix). For each item, we asked the surgeon's opinion according to the 5-point Likert scale ranging from "never" to "always", "least" to "most", or "smallest" to "highest". The surgeons were also asked their opinion, ranging from "maximally invasive" to "minimally invasive", about the following 5 interventions for lumbar disc herniation: 1) bilateral muscle retraction with bilateral discectomy; 2) bilateral muscle retraction with unilateral discectomy; 3) unilateral transflaval discectomy; 4) MED; and 5) PLDD.

Data were analyzed using descriptive statistics. All frequencies were based on the total number of valid responders. The answers on the 5-point Likert scale were dichotomized into 2 opposite categories: "never" and "almost never" were merged into 1 category, and "almost always" and "always" were merged into the other category. The intermediate option "no opinion" was documented as "neutral". The data were analyzed using version 14 of SPSS for Windows.

RESULTS

Surgeons' characteristics

Ninety-five out of 131 questionnaires were returned. Nine responding surgeons did not perform lumbar disc surgery. Therefore, 86 (70%) of 122 potentially usable questionnaires were included for analysis. There were 85 male (99%) and 1 female (1%) surgeons. The respondents consisted of 64 neurosurgeons (74%) and 22 orthopaedic surgeons (26%) with a median clinical experience of 14 years (interquartile range 7–20 years; Table 1).

Table 1: Demographic data and surgical characteristics of 86 surgeons responding to the questionnaire.

Characteristic	No. (valid %)*
no. of respondents	86 (70)
sex	
male	85 (99)
female	1 (1)
specialty	
neurosurgery	64 (74)
orthopedic surgery	22 (26)
median clinical experience in yrs	14 (IQR 7–20)
no. of lumbar discectomies / yr	
<10	9 (10.6)
10–20	5 (5.9)
20–50	12 (14.1)
50–100	28 (32.9)
>100	31 (36.5)
NR	1
routinely performed op technique	
bilat muscle retraction w/ bilat discectomy	5 (5.8)
bilat muscle retraction w/ unilat discectomy	22 (25.6)
unilat transflaval discectomy	54 (62.8)
MED	5 (5.8)
PLDD	0
extent of disc removal	
sequesterectomy	4 (4.7)
minimal unilat discectomy	8 (9.4)
extensive unilat discectomy	66 (77.6)
subtotal bilat discectomy	4 (4.7)
total bilat discectomy	3 (3.5)
NR	1

* Percentage based on valid responses is given in parentheses; respondents comprise 86 of 122 surgeons who perform lumbar disc surgery. Abbreviations: IQR = interquartile range; NR = no response.

Surgical procedure characteristics

Almost 70% of the surgeons performed >50 lumbar discectomies per year (Table 1). The most frequently applied technique was unilateral muscle retraction with unilateral transflaval discectomy (63%), followed by bilateral muscle retraction with unilateral discectomy (26%). Bilateral discectomy and MED were infrequently performed as standard treatment, and PLDD was never carried out by spine surgeons.

Nearly 78% of the surgeons performed extensive unilateral discectomy, 9.4% performed minimal unilateral discectomy, 4.7% did sequesterectomy only, 4.7% did subtotal bilateral discectomy, and 3.5% performed total bilateral discectomy. Figure 1 and 2 show comparisons of the routinely performed surgical interventions and the total amount of disc removal among neurosurgeons and orthopaedic surgeons.

Expectations for surgical outcome

The surgeons' expectations for the effectiveness of different procedures after 8 weeks and 2 years were evaluated and compared against each other (Table 2). Unilateral muscle retraction with unilateral transflaval discectomy, bilateral muscle retraction with unilateral discectomy, and MED were expected to be most effective at 8 weeks (86, 73, and 73% of surgeons, respectively), whereas PLDD was expected to be least effective at 8 weeks (56% of surgeons). At 2 years, unilateral muscle retraction with unilateral transflaval discectomy and bilateral muscle retraction with unilateral discectomy were also expected to be most effective (84 and 79% of surgeons, respectively). The least effective procedures at 2 years were expected to be MED and PLDD (19 and 65% of surgeons, respectively).

The majority of the surgeons expected bilateral muscle retraction with bilateral discectomy to be associated with the most low-back pain at 8 weeks (72% of surgeons) and 2 years (45% of surgeons). The least low-back pain at 8 weeks was expected after MED and PLDD (82 and 85% of surgeons, respectively); this was also true after 2 years (63 and 73% of surgeons, respectively).

Recurrent disc herniation at 8 weeks was expected to be lowest after bilateral muscle retraction with bilateral discectomy and bilateral muscle retraction with unilateral discectomy (91 and 81% of surgeons, respectively) and highest after MED and PLDD (46 and 79% of surgeons, respectively). After 2 years, the expected recurrence rate was comparable; lowest after bilateral muscle retraction with bilateral discectomy (88% of surgeons) and highest after MED and PLDD (56 and 76% of surgeons, respectively).

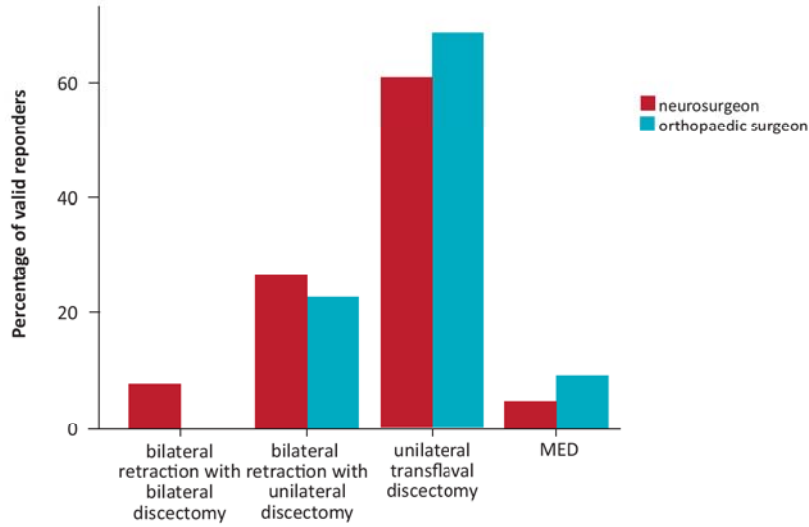


Figure 1: Bar graph comparing routinely performed surgical procedures between neurosurgeons and orthopaedic surgeons. Unilateral transflaval discectomy is the most frequently performed procedure in both groups, and bilateral muscle retraction with bilateral discectomy is only used by some neurosurgeons.

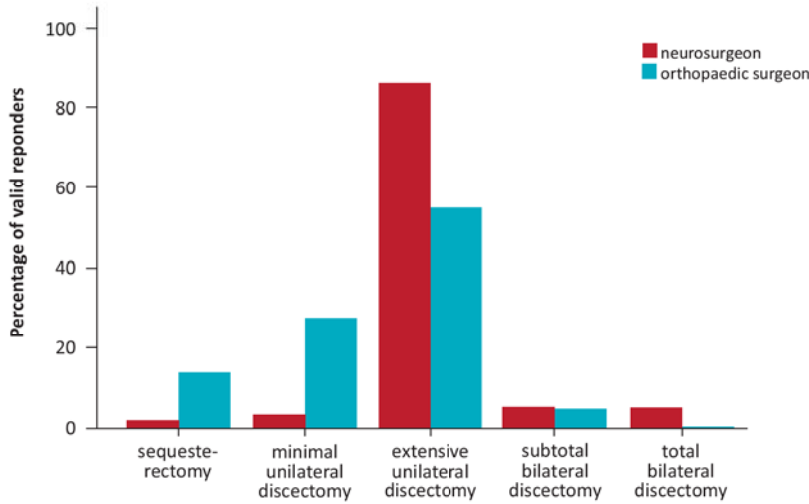


Figure 2: Bar graph showing extent of disc removal among neurosurgeons and orthopaedic surgeons. Extensive unilateral discectomy is most frequently performed in both groups.

Table 2: Surgeons' opinions on effectiveness and expected results of 5 different lumbar disc interventions.*

Intervention					
Expected result	Bilat retraction & bilat discectomy	Bilateral retraction & unilat discectomy	Unilat transflaval discectomy	MED	PLDD
effectiveness at 8 wks					
most	61.7	73.1	86.1	72.9	17.0
neutral	23.5	25.4	12.7	15.7	27.1
least	14.8	1.5	1.3	11.4	55.9
effectiveness at 2 yrs					
most	70.6	79.1	83.8	56.5	11.3
neutral	17.6	19.4	13.8	24.6	24.2
least	11.7	1.5	2.5	18.8	64.5
back pain at 8 wks					
most	72.2	62.5	7.6	1.4	1.7
neutral	23.6	29.2	55.7	16.7	13.6
least	4.2	8.3	36.7	82.0	84.8
back pain at 2 yrs					
most	45.0	35.7	5.1	5.0	2.8
neutral	36.6	40.0	43.6	31.7	24.3
least	18.3	24.3	51.3	63.3	72.9
recurrent disc herniation at 8 wks					
most	2.8	1.4	1.4	46.4	79.0
neutral	5.8	17.1	35.1	25.4	11.3
least	91.3	81.4	63.5	28.1	9.6
recurrent disc herniation at 2 yrs					
most	4.3	2.9	2.6	55.7	75.8
neutral	12.9	28.6	39.5	22.9	21.0
least	88.0	68.6	57.9	21.4	3.2
complications					
most	45.1	19.1	5.2	23.2	19.7
neutral	23.9	41.2	32.9	29.0	21.4
least	31.0	39.7	61.9	47.8	58.9

* The questionnaire contained various clinical outcome parameters. The numbers shown are percentages of valid responses.

Surgical complications were expected to be highest during bilateral discectomy and MED (45 and 23% of surgeons, respectively) and lowest during unilateral transflaval discectomy and PLDD (62 and 59% of respondents, respectively).

Timing of surgery

No surgeon reported operating on patients suffering <4 weeks of radicular leg pain. Thirty-four percent of the responding surgeons operated between 4 and 8 weeks on patients who experienced leg pain, 42% operated between 8 and 12 weeks, and another 24% waited for leg pain to last >12 weeks before operating.

Eighty-four percent of the surgeons invariably performed operations in patients with <24 hours' duration of painful complete drop foot, 79% operated on Grade 1 or 2 paresis (categorized according to the Medical Research Council scale), 52% on Grade 3 paresis, and 29% did so in cases of Grade 4 paresis (Table 3). If the painful drop foot lasted for >1 week, the choice in favor of surgery decreased; 65% for paralysis, 63% for Grade 1 or 2 paresis, and 49% for Grade 3. Patients with painless paralysis existing <24 hours underwent immediate operation by 60% of the responding surgeons. Whenever the painless paralysis was present >1 week, only 27% of the surgeons performed surgery. In cases of patients with a painless drop foot Grade 3 or 4 lasting >1 week, 65 and 74% of the surgeons, respectively, never performed surgery.

Sixty-five percent of the surgeons reported that they operated on patients presenting with a cauda equina syndrome directly from the emergency room, 67% operated as soon as possible, 55% at the end of the day, and 21% treated them as the first patient the next morning. Less than 5% of the surgeons treated patients with a cauda equina syndrome at the end of the next day.

Postoperative Management

In terms of postoperative advise and restrictions, 17% of the surgeons allowed their patients to mobilize as soon as they returned to the ward, 25% after a few hours, 53% on Day 1 and 5% on Day 2. No patient was advised to wait >2 days postoperatively to mobilize.

Eighty-six percent of the surgeons prescribed physiotherapy without exception during admission and 65% always prescribed it at discharge. Twenty-four percent of the surgeons never send their patients for physiotherapy after discharge (Table 4). Forty-five percent of the respondents strongly agreed with the statement that postoperative physiotherapy is

essential for the patient's recovery, whereas 30% of the surgeons strongly doubt the value of postoperative physiotherapy.

Table 3: Timing of surgery in patients with painful or painless drop foot and those with cauda equina syndrome due to lumbar disc herniations.*

Syndrome	Surgical timing		
	Never	Sometimes	Always
<24-hr painful drop foot			
paralysis	4.9	11.1	84.0
paresis Grades 1-2	2.5	19.0	78.5
paresis Grade 3	22.8	25.3	51.9
paresis Grade 4	53.1	17.7	29.1
>1-wk painful drop foot			
paralysis	10.1	25.3	64.6
paresis Grades 1-2	7.6	29.1	63.3
paresis Grade 3	27.8	22.8	49.4
paresis Grade 4	40.5	29.1	30.4
<24-hr painless drop foot			
paralysis	24.1	16.5	59.5
paresis Grades 1-2	29.2	25.6	46.2
paresis Grade 3	46.8	21.5	31.6
paresis Grade 4	60.0	23.8	16.3
>1 -wk painless drop foot			
paralysis	43.0	30.4	26.6
paresis Grades 1-2	43.5	34.6	21.8
paresis Grade 3	64.5	21.5	14.0
paresis Grade 4	73.8	17.5	8.8
cauda equina syndrome			
straight from ER	19.5	15.6	65.0
as soon as possible	19.4	13.4	67.1
end of the day	18.8	26.1	55.1
first op next morning	61.9	17.5	20.6
by end of next day	88.7	6.5	4.8

* Surgeons were asked if they would perform operations in these patients "never", "sometimes", or "always". The numbers shown are percentages of valid responses. Abbreviations: ER = emergency room.

In terms of postoperative work restrictions in general, 9% of the surgeons allowed their patients to resume work the day after discharge, 13% after 2 weeks, 47% after 4 weeks, 89% after 8 weeks, and 88% of the surgeons allowed their patients to resume work after 12 weeks.

Table 4: Postoperative management in terms of physiotherapy and work resumption.*

Postop management	Course advised		
	Never	Sometimes	Always
postop physiotherapy during admission	6.0	8.3	85.7
postop physiotherapy after discharge	24.1	10.8	65.0
resumption of work advised			
directly after discharge	89.5	1.8	8.8
after 2 wks	53.6	33.9	12.5
after 4 wks	15.2	37.9	47.0
after 8 wks	6.3	4.8	88.9
after 12 wks	10.7	1.8	87.5

* Surgeons were asked if they prescribed physiotherapy and gave restrictions on work “never”, “sometimes”, or “always”. The numbers shown are percentages of valid responses.

DISCUSSION

The present study shows the results of a survey among spine surgeons in the Netherlands regarding the management of lumbar disc herniation. The majority of the respondents had extensive experience with lumbar disc surgery and performed >50 lumbar discectomies each year. The surgical procedure most routinely performed by the majority of the respondents was unilateral muscle retraction with unilateral transflaval discectomy. This is in agreement with the worldwide data on the most commonly performed surgical technique. In our survey, MED was infrequently chosen as standard procedure and PLDD was never used routinely. Selection bias may have occurred because spine surgeons occasionally perform MED in selected patients with a clear case unilateral disc protrusion without lateral recess stenosis. Whether minimally invasive techniques such as MED will be the new standard has to be determined in randomised clinical trials.^{8,11}

The surgeon’s expectations for various lumbar disc procedures were evaluated. Unilateral transflaval discectomy, preceded by unilateral or bilateral muscle retraction, was expected to be the most effective treatment at 8 weeks and 2 years. This may be influenced by the

fact that the majority of surgeons routinely performed unilateral discectomy and therefore had the highest expectations for this approach. The MED technique was reported to be somewhat less effective than unilateral transflaval discectomy after 8 weeks, but remarkably less effective after 2 years. This could be explained by the fact that most of the respondents expected a higher recurrence rate of herniation with MED compared with open unilateral transflaval discectomy. Limited exposure during MED might be responsible for recurrent disc herniation. The least effective treatment with the highest recurrence rate was expected to be PLDD. Although there is no scientific proof of its inefficacy, the relatively disappointing clinical outcome of chemonucleolysis might be extrapolated to PLDD.¹¹ Due to the minimally invasive character of PLDD and MED, low-back pain was expected to be lower in the short and long term, but substantial after bilateral muscle retraction with bilateral discectomy.

Nearly all responding surgeons expected the lowest incidence of recurrent disc herniation after bilateral muscle retraction with bilateral discectomy. It must be noted, however, that only a few surgeons routinely performed this extensive approach. The lower recurrence rate was probably surpassed by the expected higher association with low-back pain and complications. The relationship between aggressive discectomy and potential re-herniation is well discussed in the literature. Carragee et al. have compared limited discectomy with aggressive subtotal discectomy and concluded that patients treated with more aggressive removal of intervertebral disc material may have a lower incidence of recurrent disc herniation, but the overall outcome is less favourable.¹² In a recent study of patients undergoing microdiscectomy or microscopic sequesterectomy, no significant difference in reherniation rate was shown, although the clinical results seemed to favor of microscopic sequesterectomy.^{13,14} However, most patients with sciatica have contained disc herniations, and a minority of patients present with loose sequestered disc fragments. This may be the reason that sequesterectomy was infrequently performed by the respondents in our survey.

Unilateral transflaval discectomy and PLDD were expected to be associated with the lowest complication rate, and MED and bilateral discectomy with the highest. Obviously, PLDD is rarely associated with surgery-related risks, and the familiarity with unilateral transflaval discectomy could be the reason for its lowest expected complication rate. The limited surgical exposure during MED compared with open surgical techniques might be responsible for a higher complication rate. On the other hand, during wide bilateral exposure and bilateral discectomy the contralateral asymptomatic side is also exposed, which might explain the expectation of a higher complication rate compared with a unilateral approach.

There was inconsistency between spine surgeons regarding the timing of surgery in patients with radicular leg pain due to lumbar disc herniation. A large proportion of the surveyed surgeons operated on patients after 8-12 weeks of disabling leg pain, some respondents were more aggressive and treated patients within 4-8 weeks of the onset of leg pain, and other surgeons were more conservative and waited more than 12 weeks to perform surgery. These results are in accordance with the ongoing discussion about the optimal period of conservative treatment before surgery is considered.³ In the Netherlands, surgery is recommended if symptoms persist >6 weeks, but the optimal timing of surgery is still being debated.⁴ In 3 recent trials, patients have been randomised between surgery and prolonged conservative treatment.¹⁵⁻¹⁷ The major advantage of early surgery is quick pain relief, but the clinical results after 1 year are similar, which legitimates prolonged conservative treatment in selected patients. Implementation of these results into clinical guidelines can be expected.

The optimal treatment of patients with lumbar disc herniation and neurological deficit is not known. Our survey showed that the majority of surgeons always operated on patients with a painful drop foot of \leq Grade 2, even when symptoms persisted >1 week. However, a study on recovery from paresis due to lumbar disc herniation has demonstrated no difference between surgically and medically treated patients.¹⁸ In patients with painless drop foot categorized as \leq Grade 2, fewer of the surveyed surgeons performed lumbar discectomy. The majority of the responding surgeons never operated on patients with long-lasting painless drop foot Grade 3 or 4. The literature on this item is scarce, but surgical treatment in patients with painless paresis is recommended by some authors.^{19,20}

Regarding patients with a cauda equina syndrome, most of the surgeons performed discectomy as soon as possible the same day. In our survey we did not define cauda equina syndrome, which is a shortcoming. In general, patients with incomplete cauda equina syndrome should undergo surgery as soon as possible to prevent irreversible damage, and patients with incontinence and complete cauda equina syndrome can be operated on a more favorable time schedule.^{21,22}

Regarding postoperative mobilization, the majority of the surgeons allowed their patients to mobilise within 24 hours of surgery. Surprisingly, according to the guidelines of the Royal Dutch Society of Physiotherapy, patients are not allowed to mobilize on the day of surgery. However, these guidelines are somewhat dated, do not take into account various surgical techniques, and surgeons were not consulted when the guidelines were made.

The majority of the surgeons routinely prescribed postoperative physiotherapy, but 24% did not. Similarly, a survey conducted among British spine surgeons demonstrated that more

than half of the surgeons did not send their patients for physiotherapy.²³ These postoperative regimens are in contradiction to the literature, which has shown strong evidence in favor of active rehabilitation. Based on a systematic review, Ostelo et al. concluded that intense exercise programs are more effective for functional outcome and lead to a faster return to work.²⁴

In terms of activity restrictions, nearly half of the responding surgeons allowed their patients to resume work within 4 weeks after surgery. The majority of the surgeons were more conservative and restricted work resumption for 8-12 weeks. This was unexpected and may change in the next few years. Postoperative restrictions may not be necessary in most patients, and there is no evidence that it is harmful to return to activity immediately after surgery.^{24,25}

Sociocultural preferences account for high geographic variation in low-back surgery rates.² For example, the rate of back surgery in the United States and the Netherlands is relatively high. Between 10.000 and 11.000 patients with lumbar disc herniations are being treated surgically in the Netherlands each year.¹ Next to these patients, informal estimates of the numbers of Dutch patients undergoing surgery in neighbouring Germany and Belgium are 3000 per year.

In the Netherlands, lumbar discectomies are being performed mainly by neurosurgeons, and an estimated 30% are provided by orthopaedic surgeons. To the best of our knowledge, this is the first study in which the daily clinical practice of neurosurgically and orthopaedically trained spine surgeons are described. Despite possible prejudices regarding certain surgical skills on the part of both orthopaedic surgeons and neurosurgeons, the present survey shows no difference in routinely performed lumbar disc surgery in general.

Some limitations of this study need to be discussed. The response rate to our questionnaire is relatively high, but selection bias may have occurred. In 2004, the Netherlands counted ~100 neurosurgeons and 400 orthopaedic surgeons. The present survey represents a selection of neurosurgeons (64 (64%) of 100) and orthopaedic surgeons (22 (5,5%) of 400) who have a special interest in spine surgery. The questionnaires were sent to members of the Dutch Spine Society only, and we have no data on surgeons performing lumbar disc surgery who are nonmembers. Therefore, solid conclusions for the general neurosurgical and orthopaedic community cannot be made. Another limitation is the design of the questionnaire. During analysis the Likert scale was dichotomized into 2 opposite categories, and it is possible that a simple multiple-choice questionnaire would have been a superior tool to reflect the surgeons' expectations more precisely.

CONCLUSIONS

The present survey provides an overview of current clinical practice regarding treatment of lumbar disc herniation among spine surgeons in the Netherlands. Unilateral transflaval discectomy with extensive unilateral disc removal is the most frequently performed surgical procedure, and minimally invasive techniques are not implemented as standard procedure. The MED and PLDD techniques were expected to be less effective compared with unilateral transflaval discectomy, with higher recurrence rates but less postoperative low-back pain. The majority of surgeons allowed their patients to mobilize within 24 hours of surgery, but were more conservative in allowing resumption of work and daily activities. Variety was demonstrated regarding the timing of surgery in patients with radicular leg pain due to lumbar disc herniation. Some consensus was shown on urgent lumbar discectomy in patients with a cauda equina syndrome, short-lasting painful drop foot, and nonsurgical treatment in patients with long-lasting painless drop foot. No differences have been shown in routinely performed lumbar disc surgery between neurosurgeons and orthopaedic surgeons with special interest in the spine.

Appendix

QUESTIONNAIRE ON THE TREATMENT OF LUMBAR DISC HERNIATION

Name:

Sex: M / F Years of clinical practice:

Neurosurgeon / Orthopaedic surgeon:

Hospital:

1. How many lumbar disc surgeries do you perform each year?

- <10
- 10-20
- 20-50
- 50- 100
- >100

2. Which surgical technique do you perform as standard procedure?

- bilateral muscle dissection with bilateral discectomy
- bilateral muscle dissection with unilateral discectomy
- unilateral transflaval discectomy / microdiscectomy
- microendoscopic discectomy (MED)
- percutaneous laser disc decompression (PLDD)
- other minimally invasive technique

3. To what extent do you remove the intervertebral disc?

- only the sequester (in case of sequestration)
- small extent of the disc unilaterally
- large extent of the disc unilaterally
- large extent of the disc bilaterally
- complete disc bilaterally

4. What is the expected effectiveness of the following techniques in the short term (8 weeks) according to you?

	least				most
<input type="checkbox"/> bilateral, bilateral discectomy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> bilateral, unilateral discectomy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> unilateral transflaval	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> MED	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> PLDD	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5. What is the expected effectiveness of the following techniques in the long term (2 years) according to you?

	least				most
<input type="checkbox"/> bilateral, bilateral discectomy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> bilateral, unilateral discectomy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> unilateral transflaval	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> MED	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> PLDD	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6. What is the expected postoperative low-back pain of the following techniques in the short term (8 weeks) according to you?

	least				most
<input type="checkbox"/> bilateral, bilateral discectomy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> bilateral, unilateral discectomy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> unilateral transflaval	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> MED	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> PLDD	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

7. What is the expected postoperative low-back pain of the following techniques in the long term (2 years) according to you?

	least				most
<input type="checkbox"/> bilateral, bilateral discectomy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> bilateral, unilateral discectomy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> unilateral transflaval	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> MED	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> PLDD	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

8. What is the expected risk of recurrent disc herniation of the following techniques in the short term (8 weeks) according to you?

	smallest				highest
<input type="checkbox"/> bilateral, bilateral discectomy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> bilateral, unilateral discectomy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> unilateral transflaval	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> MED	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> PLDD	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

9. What is the expected risk of recurrent disc herniation of the following techniques in the long term (2 years) according to you?

	smallest				highest
<input type="checkbox"/> bilateral, bilateral discectomy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> bilateral, unilateral discectomy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> unilateral transflaval	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> MED	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> PLDD	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

10. What is the expected complication risk of the following techniques according to you?

	smallest				highest
<input type="checkbox"/> bilateral, bilateral discectomy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> bilateral, unilateral discectomy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> unilateral transflaval	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> MED	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> PLDD	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

11. What is the minimum duration of radicular pain your patient needs to have before you decide to perform surgery?

- <2 weeks
- 2-4 weeks
- 4-8 weeks
- 8-12 weeks
- >12 weeks

12. Your patient has a drop foot < 24 hours with leg pain. When do you decide to operate?

	never				always
<input type="checkbox"/> total paralysis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> paresis Grades 1-2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> paresis Grade 3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> paresis Grade 4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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