

## 1982 Volvo Award in Clinical Science

# Lumbar Disc Herniation A Controlled, Prospective Study with Ten Years of Observation

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Two hundred eighty patients with herniated lumbar discs, verified by radiculography, were divided into three groups. One group, which mainly will be dealt with in this paper, consisted of 126 patients with uncertain indication for surgical treatment, who had their therapy decided by randomization which permitted comparison between the results of surgical and conservative treatment. Another group comprising 67 patients had symptoms and signs that beyond doubt, required surgical therapy. The third group of 87 patients was treated conservatively because there was no indication for operative intervention. Follow-up examinations in the first group were performed after one, four, and ten years.

The controlled trial showed a statistically significant better result in the surgically treated group at the one-year follow-up examination. After four years the operated patients still showed better results, but the difference was no longer statistically significant. Only minor changes took place during the last six years of observation. [Key words: lumbar disc herniation, surgery, prognostic factors, epidemiology]

**T**HERE IS still disagreement concerning the treatment of ruptured lumbar and lumbosacral intervertebral discs. In most cases a conservative attitude with different types of physiotherapy is preferred as the first choice. If recovery is delayed, surgical intervention has to be considered. Indications for operation vary according to the personal opinion of the different doctors. This unsatisfactory situation was the reason why a prospective controlled study was planned in order to compare the effect of operation and nonoperative treatment in two randomized groups.

The numerous publications on the results of treatment in patients with sciatica have several shortcomings: most of them are retrospective studies on patients selected for treatment, the follow-up examinations of the operated series of patients have been performed by the surgeon himself, and radiculography (myelography) has often not been carried out in the

conservatively treated group. Neither may any uniform conclusions be drawn from the published papers with regard to the different treatments because the results vary considerably.<sup>7,8,10,12,17,20,26,31,32</sup> Comparing the outcome of operative and conservative therapy in selected patients, Hakelius<sup>9</sup> and Nashold and Hrubec<sup>24</sup> did not find any significant difference between the final results of surgical and nonsurgical therapy after, respectively, seven years and 20 years of observation. Even if other authors reported more favorable results in the operated groups,<sup>13,16,28,33,37</sup> doubt arose whether the surgical treatment in the long run had any advantage over conservative treatment.

The purpose of this study with a ten-year follow-up was to provide more reliable data that might be useful in the choice of treatment for patients with lumbar disc herniation.

### TOTAL MATERIAL

The study included 280 patients with sciatica, 165 men and 115 women, admitted consecutively to the Department of Neurology, Ullevaal Hospital, during 1970 and 1971. Clinical symptoms and signs, as a rule of a fifth lumbar and/or first sacral root lesion, corre-

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sponded to the findings at radiculography performed shortly after admission. Patients with spondylolisthesis or previous operations on the spine were excluded.

### CLASSIFICATION

During 14 days in hospital, the patients were referred to one of three groups (Table 1). Group I, which mainly will be dealt with in this paper, consisted of 126 patients between 25 and 55 years of age. After 14 days they still had radicular pain provoked by moderate exercise, by sitting position, or by increased abdominal pressure (coughing, sneezing, or defecation). Other symptoms and signs were restricted mobility of the spine, defence scoliosis (tilt), positive straight-leg raising (SLR) test, and/or persistent weakness of muscle groups.

The choice of further therapy in such patients is a matter of discussion. No objections could be raised against a randomization into one group selected for operation and another for continued physiotherapy. All patients were informed about the disagreement among members of the medical profession with regard to therapy, and gave their consent to the procedure. The randomization was done in the Life Insurance Companies' Institute for Medical Statistics at Ullevaal Hospital (Head Dr. Knut Westlund). Two persons were present when the envelope with the patient's identification number and the future treatment was opened. Those who were selected for operation were demonstrated at weekly conferences with the staff of the Neurosurgical Department in order to confirm the surgical indications and exclude patients with contraindications. No patient was excluded. The patients selected for further conservative treatment were transferred to Sunnaas Rehabilitation Hospital for an average period of six weeks' physiotherapy.

Group II comprised 67 patients presenting definite indications for surgery: severe and immobile scoliosis, intolerable pain, suddenly occurring and/or progressive muscle weakness and/or bladder-rectum paresis.

Group III included 87 patients who continued the conservative treatment. They had moderate symptoms and/or signs but showed continuous improvement as a result of bed rest, physiotherapy, and medication during the observation period.

### METHODS

The examinations on admission were carried out according to traditional methods. The recording of the case history included the following data: (1) time of first and present attack of low back pain (LBP) and sciatica and occurrence of repeated attacks; (2) description of attack: type of onset; possible causes of first and present attack; interval between LBP and sciatica; (3) occupation; (4) incapacity for work: previous sick-leave and incapacity during present attack; (5) physical activity at leisure; (6) health condition and previous diseases, education, family situation, economic state, housing conditions; and (7) psychopathological symptoms.

The physical examination was comprised of the following: (1) general physical investigation of heart, lungs, blood pressure and urine; (2) a complete neurological examination; (3) mobility of the spine; (4) build; and (5) radiological examination.

After two weeks in the department the motor function was registered as maximal isometric strength of the muscle groups in the legs by means of a transducer and transferred to a paper by a pen recorder.<sup>39</sup>

The sensory system was tested by the sensation to pinprick in the traditional identification regions.<sup>4</sup>

Mobility of the spine in sagittal plane was recorded as the difference in distance between the spinous processes of L<sub>1</sub> and S<sub>1</sub> measured with compass points in erect, flexed, and hyperextended position.<sup>38</sup> Mobility in the frontal plane was recorded by maximal flexion to both sides. The distance between a plumb line through S<sub>1</sub> and the spinous process of L<sub>1</sub> was measured.

The variables of build were height, sitting height, and net weight.

All patients were submitted to radiological examination of the lumbo-sacral spine, pelvis, and thorax. In 231 patients the total spine was radiographed in order to count the number of presacral vertebrae. Radiculography with water soluble contrast (Myelotrast "A-L") was performed on all patients during the first week in hospital (Department of Neuroradiology). The diagnosis "definite herniation" required indentation in the contrast-filled dural sac and the lack of contrast filling of the root sheath which corresponded to the neurological symptoms and signs. The term "possible disc herniation" was used to describe minor changes as a widened and/or shortened root pocket as compared with the other side.<sup>1</sup>

**Hospital Regime.** A uniform initial treatment was given to all patients who did not require immediate

Table 1. Total Material by Main Group, Age, and Sex

	Randomized		Selected		Total
	Conservative	Operated	Conservative	Operated	
Males	36	32	52	45	165
Females	30	28	35	22	115
Total	66	60	87	67	280
Mean age years	41.7	40.0	44.4	40.2	41.6

operation. This therapeutic regimen which lasted 14 days was conducted according to the following program:

*First week:* Strict bed rest except that the patient was allowed to go to the toilet. Moderate isometric exercises were performed. Light analgesics were given. If necessary, levomepromazine was added.<sup>41</sup> A 10-inch wide belt and crutches were useful as a support during the visit to the toilet.

*Second week:* Partial bed rest with gradual increase of activity and exercises. Instructions were continued as group lessons ("Back school").<sup>18,43</sup>

**Operation Technique.** The patients were operated upon in the knee-elbow position. After removal of the ligamentum flavum and in most cases a small resection of the edge of the vertebral arch above and below the exposed intervertebral space, the herniated mass of cartilage was removed extradurally. Excochleation of the disc was then performed. The patient was out of bed on the following day and was discharged on the 7.0–9.0 postoperative day without further treatment. The author was present at a majority of the operations and had the opportunity to discuss the findings with the neurosurgeons.

**System of Follow-Up.** During the first year of observation, a questionnaire was sent to all the patients after three, six, and nine months.

After one year the patients were re-examined by the author. A complete neurological examination and an evaluation of the psychosocial conditions were performed. Special attention was paid to the working capacity during the first year, to presence or absence of pain, to the need of analgesics and to the patient's ability to participate in leisure activities. The mobility of the spine, vertebral, and/or paravertebral tenderness and SLR test were included in the examination. According to the results of this follow-up, the patients were divided into four groups: Good, Fair, Poor, and Bad, which corresponded to the patient's subjective statement:

## Results

<i>Author's Evaluation</i>	<i>Patient's Statement</i>
Good	Completely satisfied
Fair	Satisfied, lesser complaints
Poor	Not satisfied, partly incapacitated
Bad	Completely incapacitated for work due to chronic back pain or sciatica

A similar questionnaire was sent to the patients two years and three years after the hospital stay. After four years all patients were again submitted to a thorough re-examination by the author. The division of the patients into four groups was done according to the same criteria as used after one year.

At the ten years follow-up examination, also per-

formed by the author, only patients in the first (randomized) group were examined.

## Statistical Methods

Standard methods of chi-square analysis have been used.<sup>6</sup> (a) Significance test in  $2 \times 2$  tables (with and without Yates' correction). (b) Test for trend in  $2 \times R$  tables. Equidistant scoring of categories has been used throughout. (c) Combination of  $2 \times 2$  tables, including an analysis of homogeneity.

The significance of differences between two means (age, duration, distance) was examined by Student's t-test.

## EPIDEMIOLOGICAL OBSERVATIONS

These observations were based on the total material of 280 patients.

The male/female ratio in the total series is 1.4–1. The preponderance of men is in accordance with all published papers on herniated disc operations.<sup>31</sup> One or more earlier attacks of LBP were reported by more than 90% of the patients. The first usually acute attack occurred at an average age of 27 years.

An average of ten years passed between the first attack of LBP and the onset of radiating pain. The sciatica usually began insidiously both in the previous and the last attack.

No factors of prognostic value that could differentiate between a transitory attack of LBP and a LBP, which was the forerunner of sciatica, were found. The only exception was a tendency to insidious onset in the last case. Consequently, any attack of LBP has to be regarded as possible initial symptom of sciatica, especially in the age group between 30 and 50 years.

The mean interval between the onset of LBP and the onset of sciatica in the attack preceding hospitalization, was three and a half weeks. There were great variations, from days to several months. With regard to occupation, the patients have been grouped in different ways. No profession showed any striking preponderance.

Psychosocial problems were registered in 29% of the patients, a frequency found also in a normal population in the Scandinavian countries.<sup>3,5,11</sup> Anxiety, depression, unspecified nervousness, and family problems were the main complaints, closely followed by alcohol addiction. No case of hysteria was registered. Ten patients or less than 4% of the total series, had psychiatric disease requiring therapy.

A positive correlation was found between psychosocial stress and lack of physical activity ( $P < 0.01$ ).

Among the indices of build, the height and sitting height in men corresponded to the findings in Norwegian soldiers.<sup>35</sup> A possible relation between the build

Table 2. Treatment After Randomization—One Year Assessment (N-126)

Result	Conservative Treatment			Operation		
	Remained in * Original Group	Operation	Total †	Operated * as Planned	Not Operated	Total †
Good	16	8	24	39	0	39
Fair	24	4	28	15	1	16
Poor	9	4	13	5	0	5
Bad	0	1	1	0	0	0
Total	49	17	66	59	1	60

\* Remained in original group/operated as planned: Chi-square for trend (1 d.f.)—10.16,  $p = 0.0015$ .

† Total randomized material: Chi-square for trend in proportions, equidistant scoring of groups (1.d.f.)—10.24,  $p = 0.0015$ .

and the occurrence of back lesions has been suggested, but could not be confirmed in this study.

The occurrence of transitional vertebrae and presacral vertebrae with caudal and cranial shift corresponded to the distribution in a normal material.<sup>30</sup> Twenty-one of the 22 patients with cranial spinal column type (23 presacral vertebrae or 23 + a transitional vertebra) had their disc lesion in the 4. lumbar intervertebral space. In the 15 patients with a caudal column type (25 presacral vertebrae or 24 + a transitional vertebra), the level of the disc lesion was evenly distributed between the 4. and 5. interspace.

Radiculography showed "definite herniations" in 90% and "possible herniations" in 10% of the patients. The 4. lumbar disc was the site of the lesion in 162 patients whereas the lumbosacral disc was affected in 118 patients. Whether a real difference exists in the incidence of lesions in the 4. and 5. disc is not known, but several authors suggest this possibility.<sup>2</sup>

### RANDOMIZED SERIES

The criteria for selection to this group and the method of investigation are described in the preceding chapter.

### RESULTS

After randomization the 126 patients in the controlled trial were referred to two groups: *Group I (a)* 66

patients who were conservatively treated, and *Group I (b)* 60 patients who were assigned to surgery.

A survey of the overall assessment at the follow-up examination after one year showed that the results were significantly better in the surgically treated group (Table 2).

The statistical analysis is complicated by the fact that 17 patients belonging to the conservatively treated *Group I (a)* were referred to operation during the first year of observation, either because of pain of prolonged duration or because the pain was aggravated. The average observation time of the 17 patients until it was decided to operate, was seven and a half months, with considerable scattering (1–11 months). These patients were re-examined one year after their operation and the result included in Tables 2, 3, and 4 under the subheading "operated" in the conservatively treated group. It is evident that the surgical results are better than the results of conservative therapy whether these 17 patients are included in the statistical evaluation or not. Only one patient was not operated on, although she was assigned to surgery. She got scared and refused operation, but this incidence did not influence the conclusion. One patient, conservatively treated, had to be operated upon in the ninth year of observation due to a relapse.

Comparison of the results after four years of observation did not show a statistically significant differ-

Table 3. Treatment After Randomization—Four Years Assessment

Result	Conservative Treatment			Operation		
	Remained in * Original Group	Operation	Total †	Operated * as Planned	Not Operated	Total †
Good	25	9	34	39	1	40
Fair	19	5	24	9	0	3
Poor	3	2	5	8	0	8
Bad	2	1	3	0	0	0
Total	49	17	66	56	1	57
Died	0	0	0	1	0	1
Not examined	0	0	0	2	0	2
Total	49	17	66	59	1	60

\* Remained in original group/operated as planned: Chi-square for trend (1 d.f.)—1.58.

† Total randomized material: Chi-square for trend (1 d.f.)—2.29.



Table 4. Treatment Results in Randomized Group—Ten Years Assessment

Result	Conservative Treatment			Operation		
	Remained in * original group	Operation	Total †	Operated * as planned	Not operated	Total †
Good	27	10	37	34	1	35
Fair	18	7	25	16	0	16
Poor	4	0	4	4	0	4
Bad	0	0	0	0	0	0
Total	49	17	66	54	1	55
Died	0	0	0	3	0	3
Not examined	0	0	0	2	0	2
Total	49	17	66	59	1	60

\* Remained in original group/operated as planned: Chi-square for trend (1 d.f.)—2.56.

† Total randomized material: Chi-square for trend (1 d.f.)—1.76.

ence, although the tendency to a more favorable effect of surgical treatment was preserved (Table 3). Two patients were not examined, and one died of cancer. Except for two patients who died of heart disease during the last six years, all turned up at the final examination after ten years. There was hardly any difference regarding results between the two treatment groups (Table 4). Only eight patients were registered as "poor" and none as "bad" compared with 16 "poor" and "bad" at the four years follow-up.

The evaluation of the patients was based on: (a) working capacity, (b) neurological deficits, (c) pain, and (d) mobility of the lumbar spine.

(a) The recovery period after leaving hospital was, as expected, shorter in the successfully conservatively treated patients, with a mean duration of seven weeks. After operation eleven weeks of recreation time was necessary.

The number of relapses during the first four years of observation among the operated patients was less than in the conservatively treated group, but the mean duration of the recurrences was the same in the two groups. A slight increase in the number of patients with relapses in the operated group was observed during the last six years of observation. Otherwise, there was no difference between the two treatment groups (Table 5). The mean duration of recurrence was 11 weeks. Only five patients had relapses in both periods.

Eleven patients were registered as permanently incapacitated and received disablement benefit during

the first four years of observation. The number increased to 15 during the last period (Table 6). Psychosocial problems were the reason for this development. Seven of these "incapacitated" patients were registered in the "fair" group at the final examination.

Three patients had one, and two patients two, reoperations. One of them had an unsatisfactory result, the others were registered in the good/fair group.

(b) Pareses were originally observed in 64 of the patients of whom 32 were operated upon and 31 had conservative treatment. One patient had to be excluded because of lack of cooperation. At the follow-up examination after one year, the restitution of muscle strength was unrelated to the type of treatment.

The improvement of muscle strength continued during the next three years of observation. At the four years follow-up examination, pareses were demonstrable in 20 patients. Only five patients had muscle weaknesses, equally distributed in both treatment groups at the final examination (Table 7).

Sensory function showed the same deficits in the two groups at the follow-up examinations. It was remarkable that sensory dysfunction was demonstrable in more than 35% of the patients ten years after hospitalization.

Abolished reflexes and positive straight-leg raising test were also equally distributed in the two treatment groups at all the follow-up examinations.

(c) Pain. No difference was recorded between the two groups (Tables 8, 9).

Table 5. Number of Patients with Relapses During the Observation Period (Permanently Incapacitated Patients Excluded)

Relapses	Conservative Treatment		Operation	
	0-4 years	4-10 years	0-4 years	4-10 years
Total material				
Relapses	14	11	8	13
No relapses	44	47	46	35
Remained in original group				
Relapses	11	9	8	13
No relapses	34	36	45	34

Table 6. Number of Incapacitated Patients at Four and Ten Years Follow-up Examination

	Conservative Treatment		Operation	
	Four years	Ten years	Four years	Ten years
Total randomized material				
Permanent incapacity	8	8	3	7
No permanent incapacity	58	58	54	48
Remained in original group				
Permanent incapacity	4	4	3	7
No permanent incapacity	45	45	53	47

(d) Spinal mobility. No difference was recorded between the two groups (Table 10). The range of mobility in the sagittal plane was reduced in the acute stage of sciatica. The major improvement took place during the first year of observation. Only minor changes were observed during the next nine years. There was no statistical difference in the frontal plane in the hospital and the follow-up examinations.

Reduced average ranges of mobility were present in both the operated and nonoperated patients who ended up with an unsatisfactory result. The difference from the good/fair group in this respect is statistically significant. This trend is already evident after one year of observation.

#### Comments on Statistics

An analysis of variables of possible value for the surgical indication has been done by means of chi-square for homogeneity in order to show any difference in percent poor/bad between subgroups of the difference "conservative"—"operated." This chi-square has one degree of freedom.

Seventeen patients who had to be operated on because of conservative treatment failure and the 49 patients who remained in the original group have also been compared with regard to different variables (Table 11): sedentary work seemed to be the only variable of any significance ( $P < 0.05$ ) in the group in which conservative treatment was discontinued.

#### Prognostic Factors After Four Years of Observation (Based on the Randomized Series)

Male patients showed a tendency to better outcome than the females. The patients without psychosocial problems had better results than the patients who were mentally and socially unstable, but the difference was not statistically significant. (In the total material significant difference in this respect was found).

Twenty-four patients with sick-leave more than three months before hospital admission had more LBP and sciatica after four years of observation than the 99 patients with a shorter sick-leave period ( $P < 0.01$ ) (Table 12).

A positive correlation was found between physical activity and favorable results. The overall assessment in the 70 physically active patients was better compared with the rest of the material ( $P < 0.05$ ).

The mean age of the patients with results good/fair was 39.9 years, as against 47.5 years in the patients with poor/bad results ( $P < 0.01$ ).

Variables without prognostic importance were occupation, build, stress-situation at work, earlier attacks of sciatica, duration of radiating symptoms, age of patients when they had their first attack of LBP and sciatica, type of onset, interval between the onset of LBP and the radiating symptoms, and the level of herniation. Statistical calculations have not been necessary for these variables.

Table 7. Number of Paretic Muscle Groups in Patients at Admission and Follow-up Examinations

	Dorsal Movement of the Foot		Abduction + Extension of the Hip + Flexion of the Knee		Flexion of the Foot		Eversion of the Foot	
	Operated	Conservatively Treated	Operated	Conservatively Treated	Operated	Conservatively Treated	Operated	Conservatively Treated
Hospital admission	62	56	45	37	16	20	17	18
One-year follow-up	33	15	15	11	7	5	9	9
Four-year follow-up	16	8	3	3	1	2	1	3
Ten-year follow-up	4	2	1	0	1	0	1	0

Table 8. Result Regarding Low-Back Pain at the Four and Ten Years Follow-up Examination

	Conservative Treatment		Operation	
	Four Years	Ten Years	Four Years	Ten Years
Low-back pain				
All patients				
No pain	38	52	36	43
Some pain	21	14	15	8
Considerable pain	7	0	6	0
Remained in original group				
No pain	26	37	35	42
Some pain	17	12	15	8
Considerable pain	6	0	6	0

### Prognostic Factors After Ten Years of Observation

At the ten-year follow-up examination, only age was correlated to unsatisfactory results. The mean age in patients with poor/bad results was 46.9 years compared with 40.3 years in patients with satisfactory outcome ( $0.05 > P > 0.02$ ). All other variables were without prognostic importance. This must be considered in relation to the small number of patients with unsatisfactory results ( $N = 8$ ).

Approximately 30% of the patients, equally distributed in the two groups, complained of cervical pain during the observation period.

Neurogenic intermittent claudication was registered in four conservatively and six operated patients at the four-year follow-up examination and in four and eight patients, respectively, at the final examination. Surgical therapy was not indicated in any of these patients.

### DISCUSSION

The controlled study has shown that, with a follow-up of one year, surgery is more efficient than conservative therapy as treatment for low-back pain and sciatica caused by disc herniation. This is the case whether the 17 patients who had to be operated on later are included or not. These 17 patients from the group randomly allocated for conservative therapy created a statistical problem. They could not be re-

moved from the trial. Neither would it be statistically correct to let them remain in the conservatively treated group or to be transferred to the original group of patients to be operated upon.<sup>27</sup> The statistical analysis has therefore been made with, as well as without, these 17 patients included. The final results in the 17 patients show the favorable effect of surgery in selected cases.

During the following nine years of observation the conservatively treated patients improved, but still the same tendency prevailed with better results in the surgically treated group. The difference was however no longer statistically significant and gradually became less noticeable.

In the nonoperated group 25% of the patients were cured (good) and 36% showed satisfactory improvement (fair). This means that approximately 60% of the operated patients may have been submitted to an unnecessary surgical procedure. Even though the operated patients generally expressed their satisfaction with the result, an operation should not be performed if other treatment will give equivalent result within an acceptable period of time. Consequently, if the neurologist or another specialist is in doubt regarding further treatment, the patient with LBP and sciatica should not automatically be referred to the surgeon. The fact that the immediate prognosis after surgery is better does not alter this view.

The statistical evaluation of the series of variables

Table 9. Result Regarding Radiating Pain at the Four and Ten Years Follow-up Examination

	Conservative Treatment		Operation	
	Four Years	Ten Years	Four Years	Ten Years
Radiating pain				
All patients				
No pain	45	65	45	54
Some pain	14	1	8	1
Considerable pain	7	0	4	0
Remained in original group				
No pain	31	48	43	53
Some pain	13	1	8	1
Considerable pain	5	0	5	0

Table 10. Result Regarding Lumbar Spine Mobility at the Four Years Follow-up Examination

	Conservative Treatment	Operation
Lumbar spine mobility		
All patients		
Sagittal plane	6.0 cm	5.9 cm
Frontal plane	4.7 cm	4.6 cm
Remained in original group		
Sagittal plane	5.9 cm	5.9 cm
Frontal plane	4.5 cm	4.6 cm

has failed to give a prognostic clue to the further course of the disease. Sedentary work may be an exception, but cannot be relied upon as an indicator for surgical treatment. One among 24 variables may by chance appear as significant at the 5% level.

A certain time of observation is necessary in patients with doubtful surgical indications. A period of three months was sufficient to decide against surgery in four-fifths of the 60% conservatively treated patients with good and fair results. An observation time of this length may be advisable. However, if all patients with doubtful surgical indications had to wait for three months before a decision was made, 40% would spend this time in a more or less painful condition with possible psychosocial consequences. In this situation it is obviously correct to inform the patient so that he/she may be able to participate in the decision at an earlier stage. Close cooperation with the patients is particularly important in a group with varying psychosocial background and unpredictable tolerance to pain.

Table 11. A Review of the Variables Investigated When Comparing the 17 Patients Who Had to be Operated Because of Conservative Treatment Failure with the 49 Patients Who Remained in the Original Group

Sex
Age
Occupation
Occupational stress
Sedentary work
Car-driving
Physical activity
Psycho-social state
Build
Straight leg raising at admission
Straight leg raising at discharge
The course of straight leg raising during hospital stay
Pareses when admitted to hospital.
Ankle jerk at the discharge
Level of herniation
Mean lumbar spine mobility at discharge
Pain complaints at discharge
Earlier attacks of sciatica
Disability in earlier attacks
Disability in latest attack
Interval between first and latest attack of LBP
Duration of latest attack
Interval between the back pain and the radiating symptoms

Table 12. Results Related to Sick-Leave Before Admission to Hospital (Four Years of Observation)

Results	Sick-Leave	
	Three Months or More	Less Than Three Months
Good/fair	17	90
Poor/bad	7	9

With regard to the relation between working capacity and type of treatment, the only difference was the shorter recovery period after conservative treatment. This difference is mainly due to the fact that 17 patients had to be referred to operative treatment. They represented the most severe cases in the conservatively treated group. In spite of relapses in approximately 20% of the patients in both groups, a marked trend toward better function of the spine and less pain was found. No patient was registered as a bad result at the final examination. The number of recurrences must also be considered in relation to the expected number of attacks of lumbago and sciatica in a normal population during a ten-year period.

Fifteen patients were permanently disabled for work and received disablement benefit. Back pain was the main complaint, but at least ten had obvious psychosocial problems as a dominating cause. Five patients had had a temporary period with severe pain, during which they were registered as permanently incapacitated. Even if the physical condition of the patients improved satisfactorily, none of them was motivated to giving up their insurance benefit. Perhaps the rules for issuing permanent disablement benefit to patients with sciatica due to a disc lesion should be revised. A temporary financial support for two to four years could be suggested. This problem is complex and has been discussed by Troup et al.<sup>34</sup> Among the neurological deficits the pareses of muscles are regarded as serious signs in patients with herniated lumbar discs. Muscle weakness is a doubtful indication for surgery if the paresis is of unknown duration. If the pressure on the root can be relieved immediately after the appearance of the paresis, surgery has been regarded as the therapy of choice and has also been the rule in this series. Unfortunately, only few patients belong to this category. Most patients are unaware of loss of motor function. Their concern and complaints are mainly centered around pain, paresthesias, and immobility.

Pain is the most important symptom in sciatica. It is a complex phenomenon, and the evaluation of intensity and duration is difficult even though recent research on the physiological mechanisms of pain has extended our knowledge.<sup>18</sup>

The distribution of pain often permits a diagnosis of the level of the lesion. If the pain originates from tis-



sues of mesodermal type, it has hardly any localizing value.<sup>42</sup> Acute lumbago, as experienced by the majority of the patients at an early stage, occurred rarely after the attack of sciatica that led to the hospital admission. Persistent chronic LBP was more commonly reported during the first four years of observation compared with the last six years. The patients generally experienced an improvement from the chronic, annoying pain to a more endurable back insufficiency in which pain only was provoked through certain movements. The mechanism behind the chronic lumbago and insufficient back is still a matter of discussion.<sup>14,15,22,23,25,36</sup>

After operation the radiating sciatic pain usually disappeared promptly or in the course of a few days. The recovery patterns during the conservative treatment showed great variety which prevented any prognostication with regard to the final result. Sometimes the site of pain changed from the lower leg to the region of the hip or sacroiliac joint and the pain became permanent. No explanation can be offered. At the final examination no patient complained of radicular pain.

The results in the group of patients with psychosocial afflictions were independent of type of treatment. Because pain is a symptom accompanied by stress, pain and psychosocial afflictions must be considered additional and perhaps mutually intensifying factors. They may strengthen the indication for surgery, in order to prevent a prolonged or, in some cases, permanent incapacity.<sup>40</sup>

The mean range of spinal mobility in operated and conservatively treated patients was the same. No damage due to the surgical intervention was registered. The complex combined movements of the spine are measured by reference marks on the body.<sup>38</sup> The method is inaccurate and gives little information regarding the behavior of the single motion segment.<sup>29</sup>

## CONCLUSIONS

In a randomized series of 126 patients with sciatica due to herniated lumbar discs with questionable operative indications, the results of surgical treatment were significantly better than the results in the conservatively treated group after one year of observation. During the following nine years of observation, this difference became less pronounced.

The natural course of the radiculopathies in disc disease is more encouraging than expected.

During the years of observation, the patients became better adjusted to the activities of daily living in spite of their back disease. Anxiety for the future is reduced even during the relapses.

The final examination after ten years showed the importance of adequate teaching and emphasized the justification of the "Back school."

Back insufficiency<sup>21</sup> was the main complaint at the

final examination, equally distributed in the two treatment groups. Spinal fusion is hardly necessary as part of the first operation for lumbar disc disease. The results of treatment in this randomized material cannot be compared with the results in patients selected for specific therapy.

The minor changes occurring between the follow-up at four years and at ten years indicate that a period of four years is sufficient for final evaluation of these patients.

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