SWESPINE

THE SWEDISH SPINE REGISTER

2010 REPORT

SEPTEMBER 2010

SWEDISH SOCIETY OF SPINAL SURGEONS

Björn Strömqvist Peter Fritzell Olle Hägg Bo Jönsson

ISBN 978-91-978553-8-9

Table of Contents

Introduction

We are pleased to present the 11th annual report from SWESPINE, the Swedish spine register. The number of reported operations is (as usual) larger than in 2008; a total of 6258 patients had surgery at 37 departments in 2009. The follow-up rate is essentially unchanged.

This year's special analysis takes a closer look at the factors that affect the results of lumbar herniated disc surgery. It can be viewed as a supplement to and further development of a couple of the earlier reports.

This year Lotta Falkendal from Sahlgrenska University Hospital in Göteborg was hired for this project to help us optimize registration the implant registration process and the follow-up rate in general.

On behalf of the register group of the Swedish Society of Spinal Surgeons

Sept. 17, 2010

Carina Blom	Peter Fritzell	Olle Hägg
Bo Jönsson	Lena Oreby	Björn Strömqvist

The study was carried out with support from the National Board of Health and Welfare/Swedish Association of Local Authorities and Region 2009 grant for national quality registers.

I. Preoperative and surgical data on lumbar spine procedures in 2009

A total of 6258 patients who had had lumbar spine surgery at a total of 37 departments were registered in 2009. In 2008, 5632 patients from 37 departments were registered.

The distribution of diagnoses for patients operated in 2009 was as follows: Lumbar disc herniation 29%, central spinal stenosis 45%, lateral spinal stenosis 7%, spondylolisthesis 5%, segmental pain/DDD (disc degenerative disorder) 10% and other 4%, see figure 1.

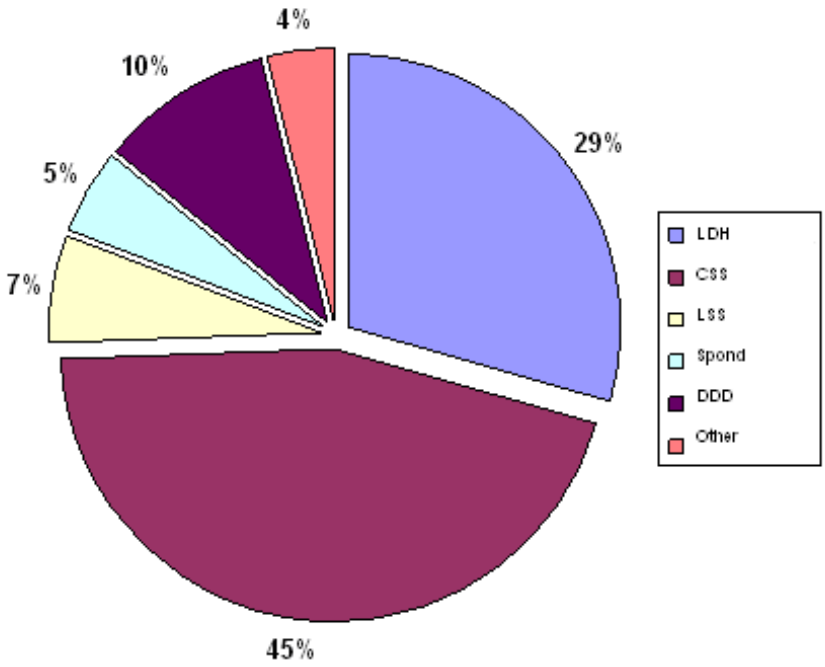


Fig. 1. Breakdown by diagnosis in the total material 2009, 6258 patients.

Diagnosis-related patient demographics and surgical data are presented below. For each variable a number are missing that are not included in the percent calculations

Lumbar disc herniation

Demographic data

In 2009, 1840 lumbar disc herniation surgeries were registered. The patients included 56% men and 44% women. The proportion of smokers was 19%. Mean patient age was 45 (14–89) years and figure 2 shows the age distribution.

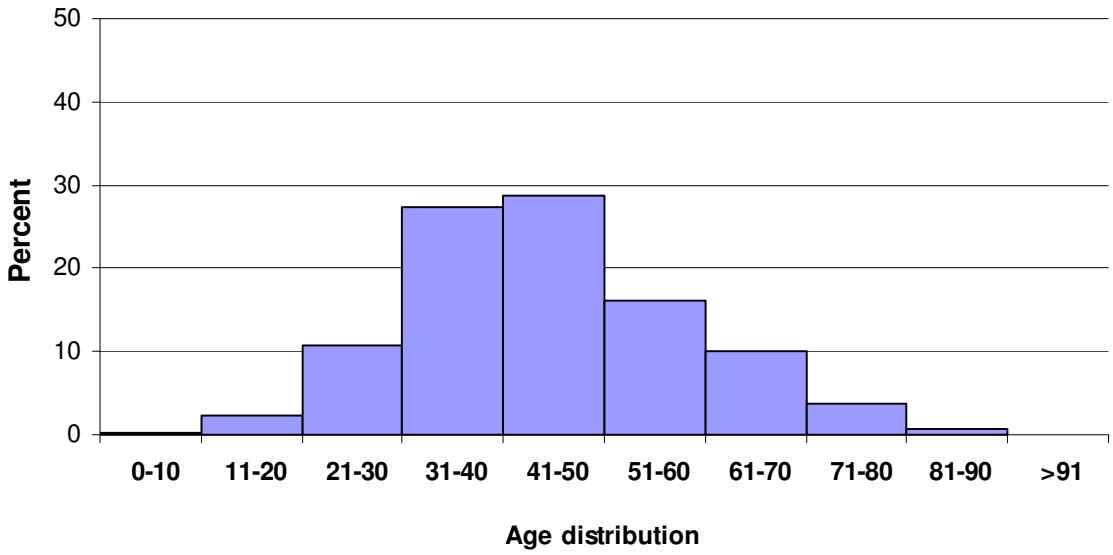


Fig 2. Distribution by age, lumbar disc herniation, n = 1840.

For 88% of patients this disc herniation operation was their first lumbar spine surgery, while 12% had been previously operated.

Preoperative duration of back pain was as follows: 6% had no back pain, 10% had a history of less than 3 months of back pain, 46% 3-12 months, 15% 1-2 years and 23% more than 2 years. Preoperative duration of leg pain/sciatica was as follows: 1% had no leg pain, 16% had leg pain for less than 3 months, 54% for 3-12 months, 13% for 1-2 years and 16% had pain for more than 2 years. Mean back pain on the visual analog scale (VAS) was 47 with a spread from 0–100, while mean leg pain/sciatica on the VAS was 65 with the same spread from 0–100. Distribution regarding both back and leg pain can be seen in figures 3 and 4.

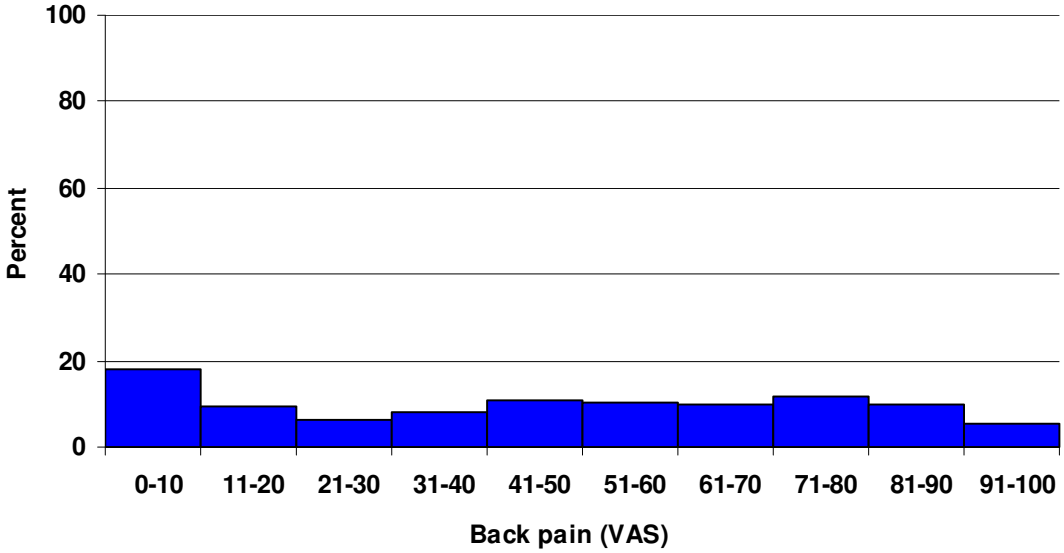


Fig 3. Back pain on the visual analog scale preoperatively in patients with lumbar disc herniation (%).

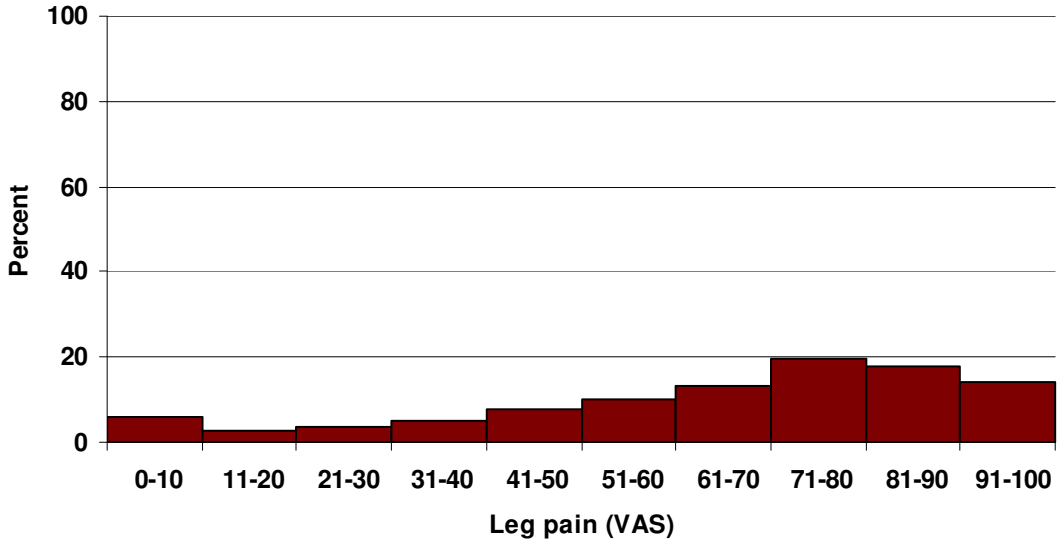


Fig 4. Leg pain on the visual analog scale preoperatively in patients with lumbar disc herniation (%).

Regular analgesic use was reported by 61% of patients, intermittent use by 29%, while 11% reported that they did not take any form of analgesics.

Walking distance was estimated at less than 100m by 32% of patients, 100–500m by 22% of patients, 500 m–1km for 16% of patients and more than 1 km by 30% of patients.

Surgical data

Conventional disc surgery was carried out in 43% of cases and microscopic disc surgery in 46%. The remaining procedures consisted of various combinations mainly involving decompressive surgery for patients with disc herniation with spinal stenosis. Mean length of stay in days, i.e., time from admission through discharge, for conventional surgery was 2.58 (0-15) and microscopic surgery 2.57 (0-15).

Central spinal stenosis

Demographic data

A total of 2814 patients were registered for operations for central spinal stenosis in 2009. The patients included 44% men and 56% women. Mean age was 68 (19–92) years. Figure 5 shows the age distribution.

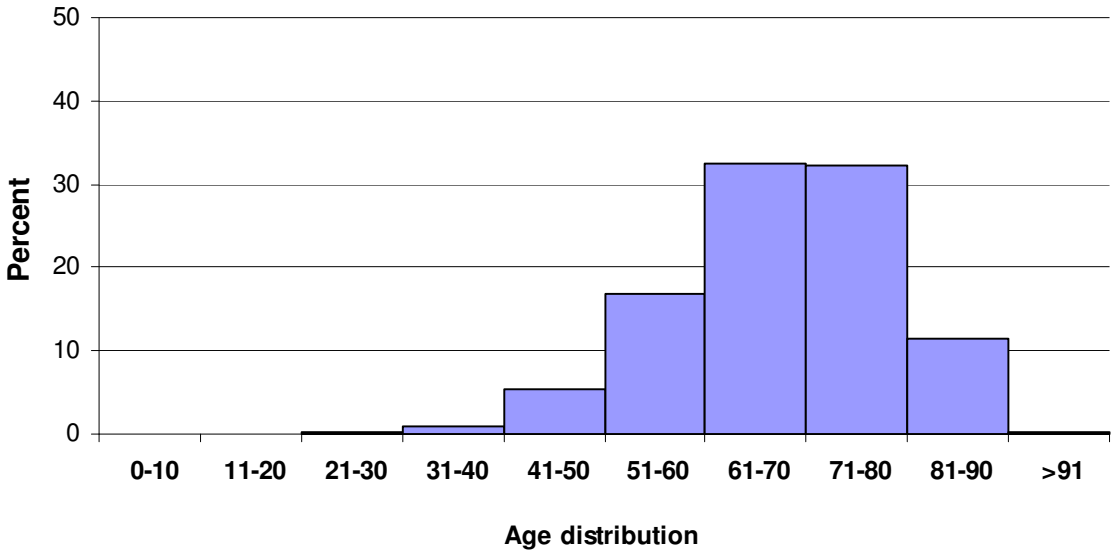


Fig 5. Distribution by age, central spinal stenosis, n = 2814 patients.

The proportion of smokers was 14%. For 81% of patients this operation was their first surgery, while 19% had been previously operated one to three times.

Preoperative duration of back pain was as follows: 6% had no back pain, 2% had a history of less than 3 months of back pain, 15% 3-12 months, 21% 1-2 years and 58% more than 2 years. Regarding leg pain, 4% of patients had no leg pain, 2% of patients with central spinal stenosis reported leg problems for less than 3 months, 22% for 3-12 months, 28% for 1-2 years and 44% reported problems for more than 2 years.

Mean back pain on the VAS in the group was 56 (0-100) and mean leg pain/sciatica (VAS) 62 (0–100). Figures 6 and 7 present the distribution of reported VAS.

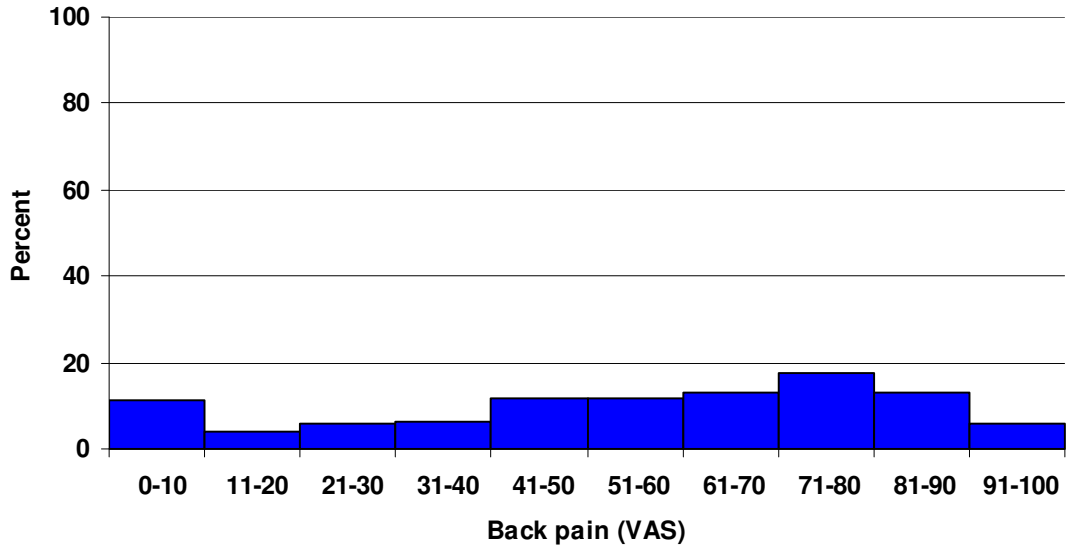


Fig 6. Back pain on the visual analog scale preoperatively in patients with central spinal stenosis (%).

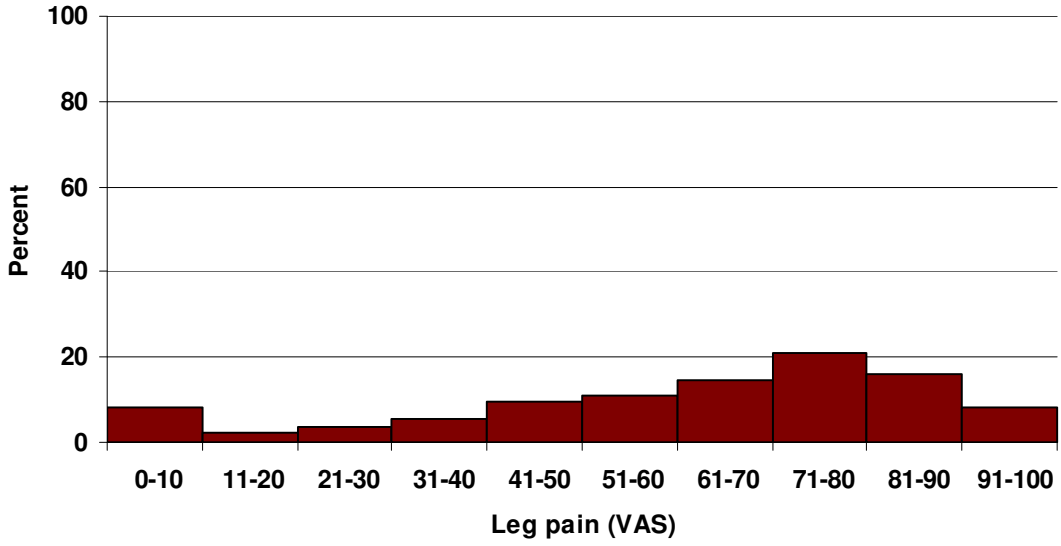


Fig 7. Leg pain on the visual analog scale preoperatively in patients with central spinal stenosis (%).

Among patients with central spinal stenosis, 55% reported regular use of analgesics, 30% reported intermittent use and 15% reported that they did not take any analgesic medication.

Walking distance was estimated at less than 100m by 43% of patients, 100–500m by 30% of patients, 500 m–1km for 13% of patients and more than 1 km by 15% of patients.

Surgical data

In 68% of cases only decompressive surgery was carried out, in 45% conventional surgery and in 23% of cases microscopic surgery. Decompression combined with posterior instrumented fusion was carried out in 23% of cases, decompression + posterior non-instrumented fusion in 4%, Decompression + TLIF in 1% and other procedures in 4%.

Mean length of stay in days for patients with conventional decompression was 4.5 (0-29), for patients with microscopic decompression, 4.1 (0-21) and for patients with decompression + posterior instrumented fusion 6.4 (2-23).

Lateral spinal stenosis

Demographic data

During the year 410 patients were operated for lateral spinal stenosis. The patients included 53% men and 47% women. The group included 18% smokers.

Mean age was 61 (21–88) years and Figure 8 shows the age distribution.

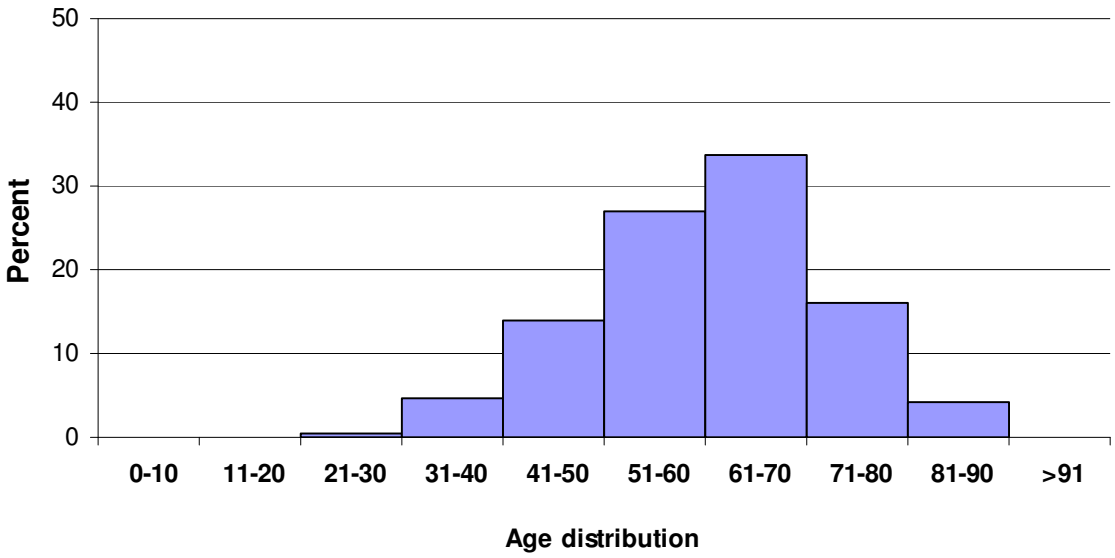


Fig 8. Distribution by age, lateral spinal stenosis, n = 410.

The majority of patients with lateral spinal stenosis, 73%, had had no previous spine surgery while 27% had been operated on one or more times before the current procedure.

Preoperative duration of back pain was as follows: 5% had no back pain, 2% had a history of less than 3 months of back pain, 18% 3-12 months, 21% 1-2 years and 54% more than 2 years. Regarding leg pain, 3% of patients with lateral spinal stenosis had no leg pain, 2% of patients reported leg problems for less than 3 months, 24% for 3-12 months, 27% for 1-2 years and 44% reported problems for more

than 2 years. Mean back pain on the VAS in the group was 54 (0–98) and mean leg pain (VAS) 65 (0–99). Figures 9 and 10 present the distribution of reported VAS.

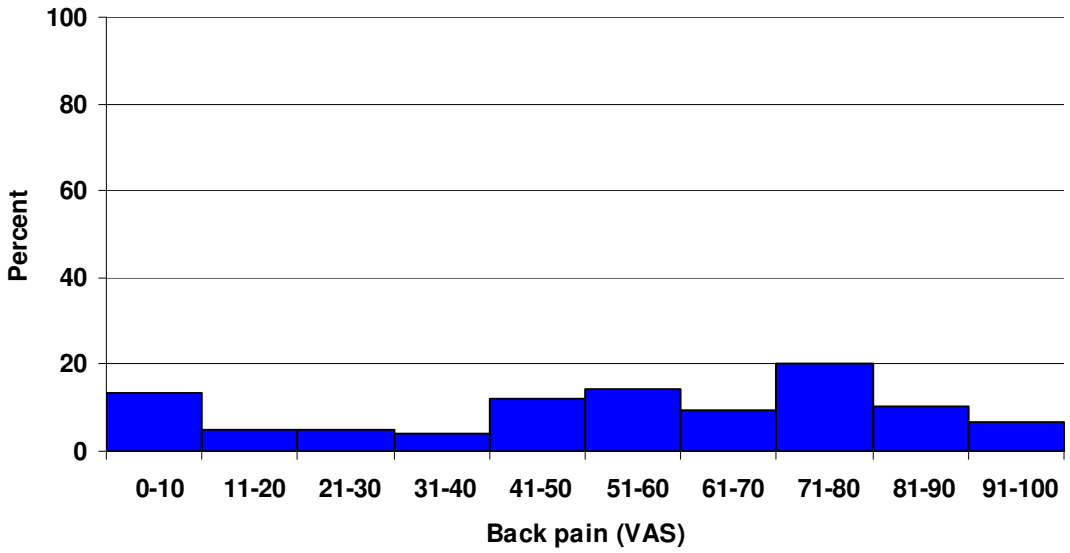


Fig 9. Back pain on the visual analog scale preoperatively in patients with lateral spinal stenosis (%).

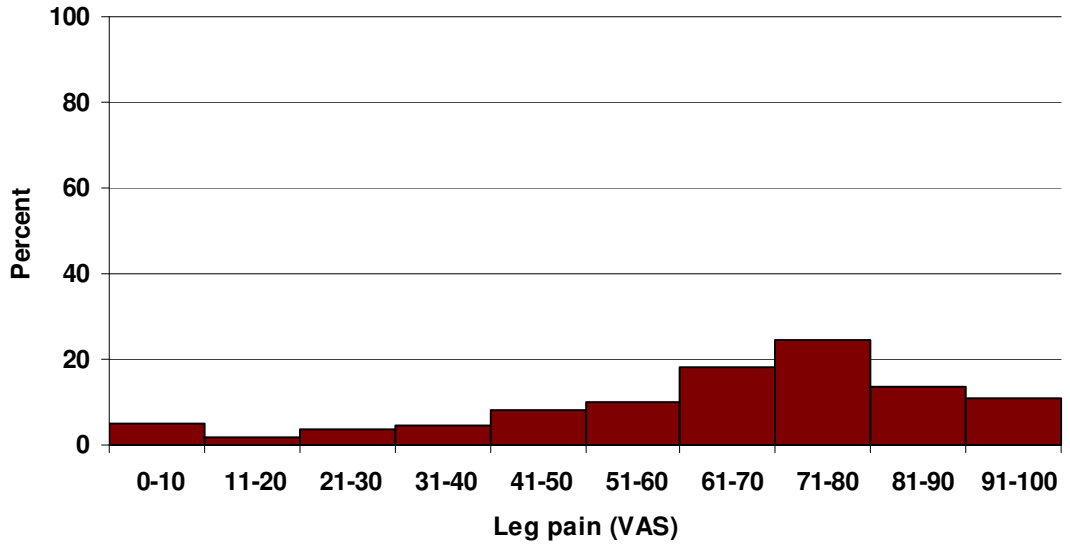


Fig 10. Leg pain on the visual analog scale preoperatively in patients with lateral spinal stenosis (%).

Regular analgesic use was reported by 56% of patients, intermittent use by 29%, and 15% reported they did not take any analgesics. The majority of patients reported limited walking ability, 30% reported they were able to walk less than 100m, 31% were able to walk 100–500m, 14% 500 m–1 km and 24% had a walking distance of more than 1 km.

Surgical data

Decompression surgery was the type of operation in the majority of cases, 73% including 45% conventional with a mean length of stay in days of 3.0 (0-18), 28% microscopic decompression with a mean length of stay of 2.7 (0-14) and 17% had decompression + posterior instrumented fusion with a mean length of stay of 5.6 (1-14) days.

Spondylolisthesis

Demographic data

A total of 306 patients, including 45% men and 55% women, were reported for 2009. This group included 14% smokers. Mean age was 50 (12–84) years and figure 11 shows the age distribution.

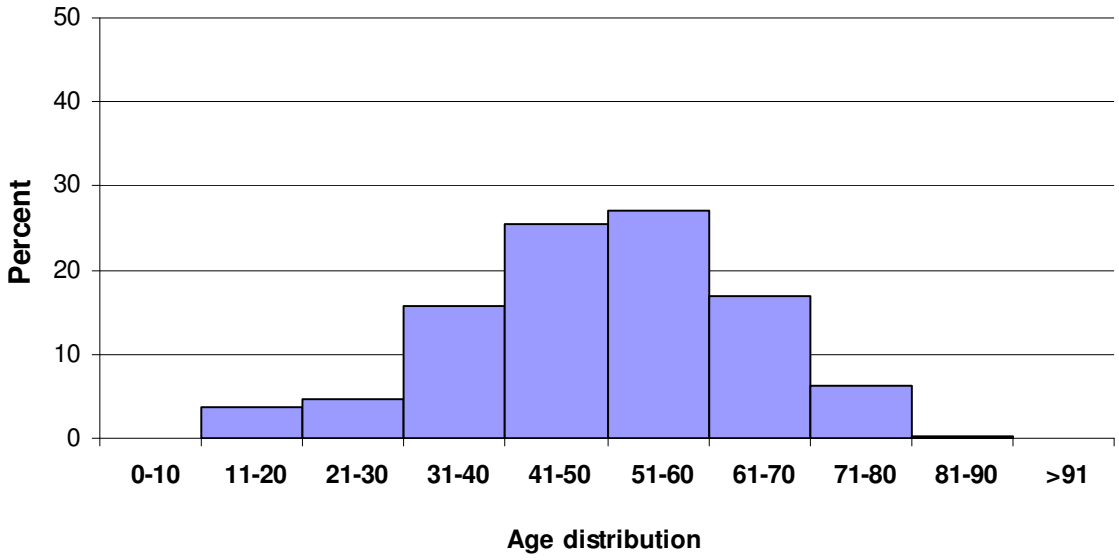


Fig 11. Distribution by age, spondylolisthesis, n = 306 patients.

For 91% of patients the current procedure was the first time they had surgery on the lumbar spine, while the remainder had one or two previous procedures.

Preoperative duration of back pain was as follows: 1% had no back pain, 2% had a history of less than 3 months of back pain, 7% 3-12 months, 23% 1-2 years and 67% more than 2 years. Regarding leg pain, 10% of patients with spondylolisthesis had no leg pain, 1% of patients with spondylolisthesis reported leg problems for less than 3 months, 14% 3-12 months, 29% 1-2 years and 46% reported problems for more than 2 years.

Preoperative lumbar pain on the VAS was 60 (0–100) and preoperative leg pain was 53 (0–98). Figures 12 and 13 present the distribution of pain on the VAS.

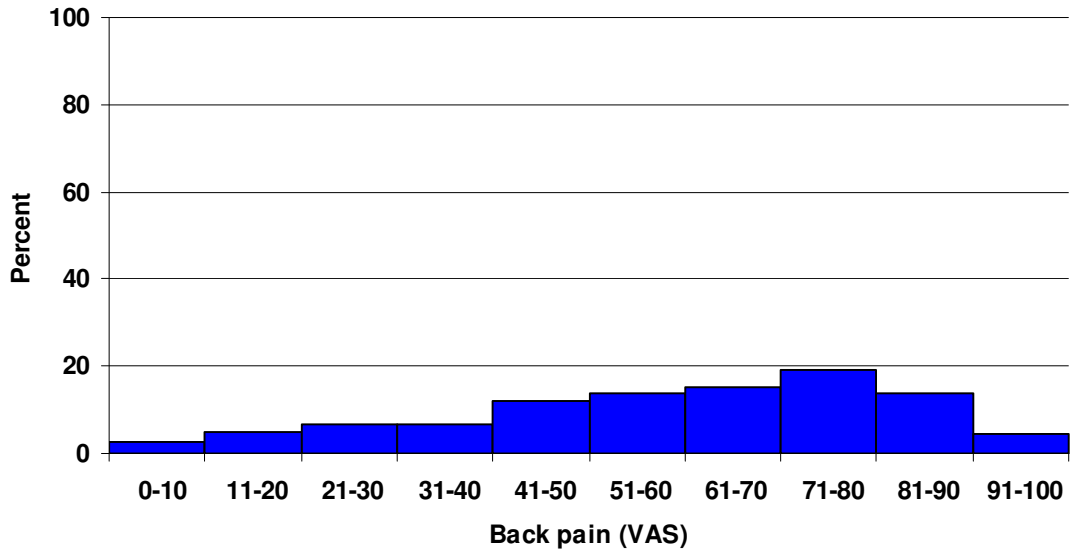


Fig 12. Back pain on the visual analog scale preoperatively in patients with spondylolisthesis (%).

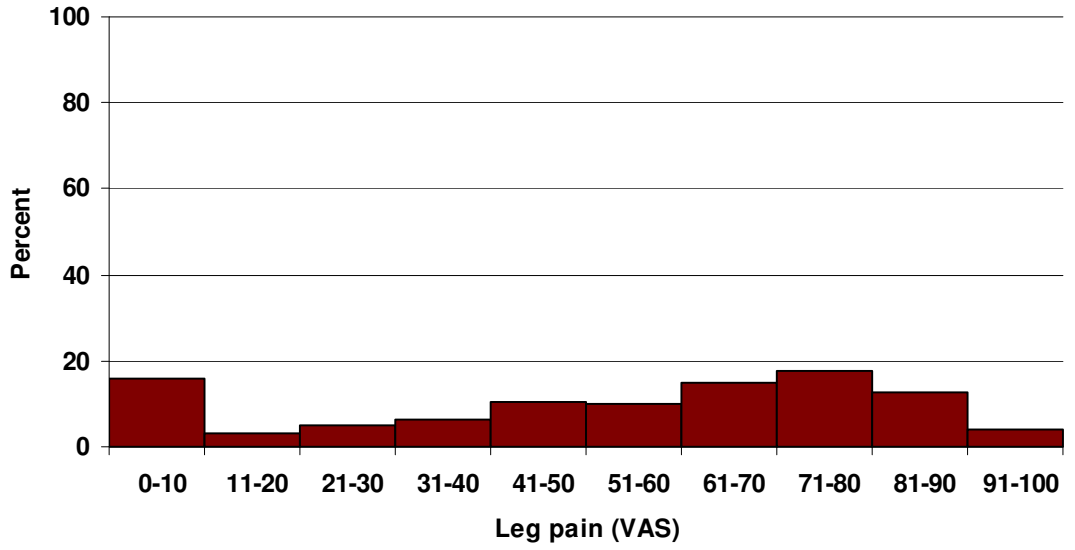


Fig 13. Leg pain on the visual analog scale in patients with spondylolisthesis (%).

Regular analgesic use was reported by 43% of patients, intermittent use by 31% of patients while 26% did not use analgesics.

Walking distance was estimated at less than 100m by 18% of patients, 100–500m by 26% of patients, 500 m–1km for 16% of patients and more than 1 km by 40% of patients.

Surgical data

Patients with spondylolisthesis had a variety of different procedures. They are presented in descending order of frequency: Decompression + instrumented fusion 62%, posterior instrumented fusion 15%, PLIF with or without foreign implant 9%, Decompression + TLIF 4%, Decompression + PLIF 3%, decompression + non-instrumented fusion 2%, posterior non-instrumented fusion 2% and decompressive interventions in the remaining cases.

Mean length of stay in days varied from 5.8 (0-30) for decompressive surgery + posterior instrumented fusion, 5.3 (2-14) for posterior instrumented fusion to 6.1 (4-8) for PLIF.

DDD (disc degenerative disorder)/segmental pain

Demographic data

A total of 653 patients were registered for surgical intervention for DDD in 2009, including 46% men and 54% women. The proportion of smokers was 16%. Mean age was 45 (15–79) years and figure 14 shows the age distribution.

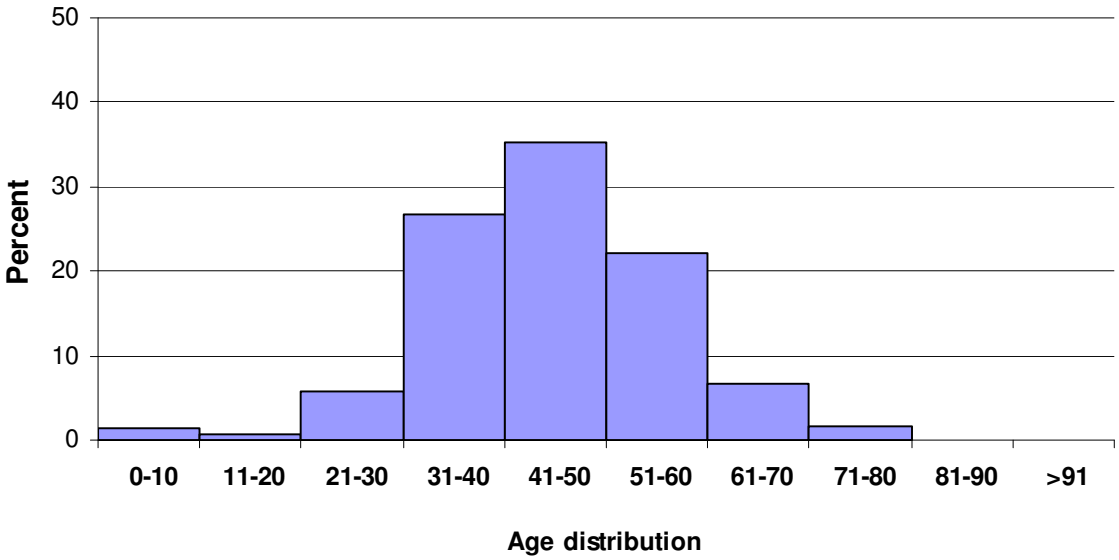


Fig 14. Distribution by age, DDD, N = 653 patients.

In this group of patients, 68% had surgery for the first time, while 32% had been operated one or more times previously.

Preoperative duration of back pain in patients with DDD was as follows: 0.9% had no back pain, 0.4% had a history of less than 3 months of back pain, 9.4% 3-12 months, 15% 1-2 years and 74.4% more than 2 years. Regarding leg pain, 16% of the patients with DDD had no leg pain, 1.6% of patients

reported leg problems for less than 3 months, 12.3% 3-12 months, 18% 1-2 years and 52% reported problems for more than 2 years.

Estimation on the VAS scale for back pain showed a mean of 63 (0-100) and leg pain, 42 (0-98). Figures 15 and 16 present the distribution of pain on the VAS.

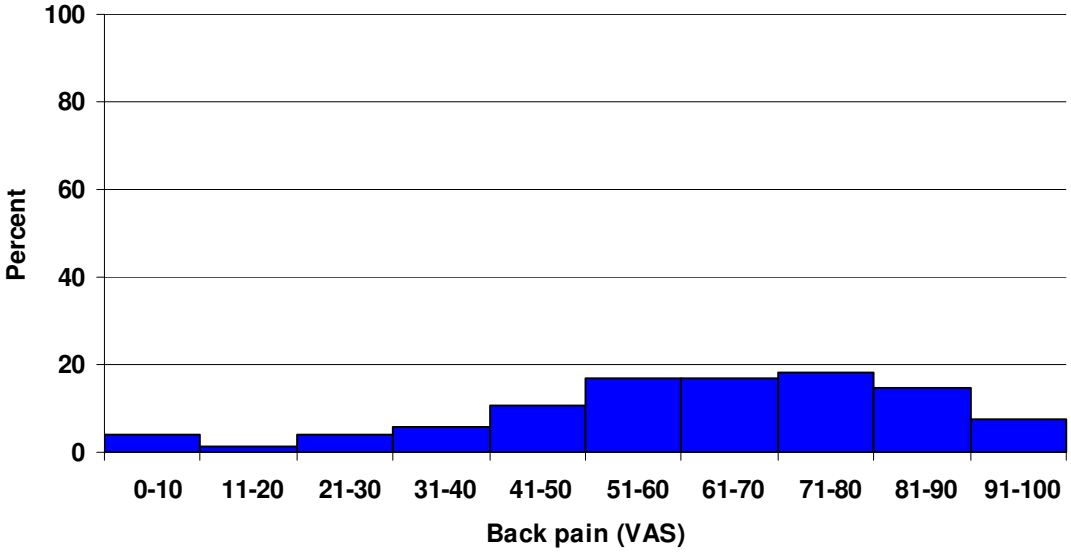


Fig 15. Back pain on the visual analog scale preoperatively in patients with DDD (%).

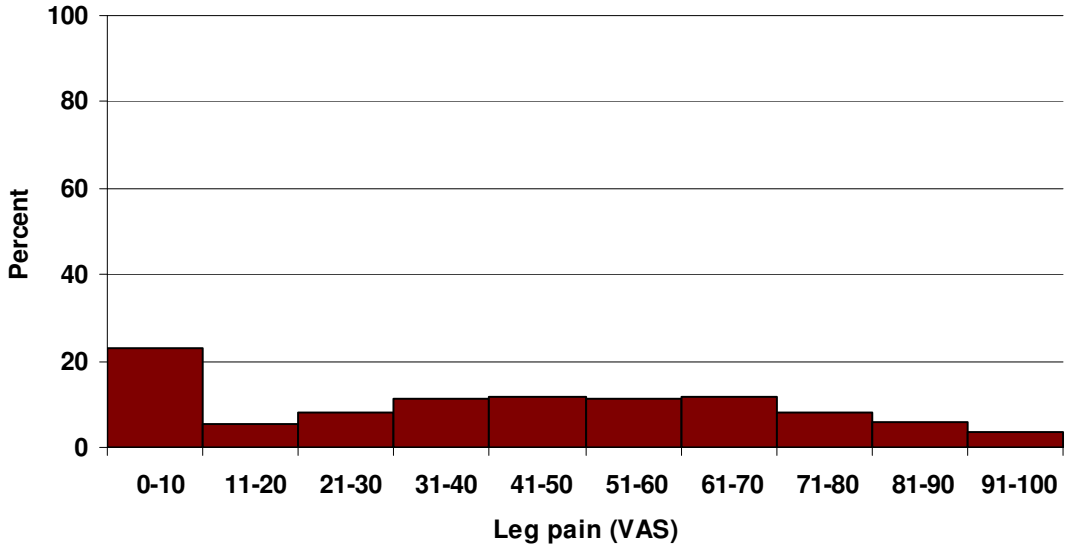


Fig 16. Leg pain on the visual analog scale preoperatively in patients with DDD (%).

Regular analgesic use was reported by 60% of patients, intermittent use by 31% while 9% never took analgesics.

Walking distance was estimated at less than 100m by 12% of patients, 100–500m by 22% of patients, 500 m–1km for 25% of patients and more than 1 km by 41% of patients.

Surgical data

A heterogenous surgical treatment spectrum was also seen for this diagnosis as follows: Posterior instrumented fusion 33%, PLIF 22%, disc prosthesis 14%, decompression + posterior instrumented fusion 12%, decompression + PLIF 5%, TLIF 5%, decompression + TLIF 5%, posterior non-instrumented fusion 2%, decompression + posterior non-instrumented fusion 1%, ALIF with or without foreign implant 0.5% and a smaller quantity of other interventions. Length of stay varied between 1.5 and 11.0 days for the different types of procedure (1-22).

II. 1-year follow-up of lumbar spine procedures in Sweden in 2008

A total of 5742 patients were operated in 2008 and 4606 (80.2%) completed one year of follow-up. The distribution is as follows: lumbar disc herniation 1323, central spinal stenosis 2058 lateral spinal stenosis 327, spondylolisthesis 231 and DDD 529. Patients with "other operations" (138) are not presented in the following results.

Lumbar disc herniation

Of 1323 patients who were operated for lumbar disc herniation and completed one year follow-up, 56% were men and 44% women, with a mean age of 45 (1–88) years.

Mean preoperative VAS for back pain was 47, compared with mean postoperative of 24. The corresponding figures for leg pain were 66 preoperatively, and 22 postoperatively . Figures 17 and 18 show preoperative and postoperative VAS for back and leg pain, respectively.

Surgical interventions: 41% conventional herniated disc surgery, 49% microscopic disc surgery, 6% decompression surgery and 4% other procedures.

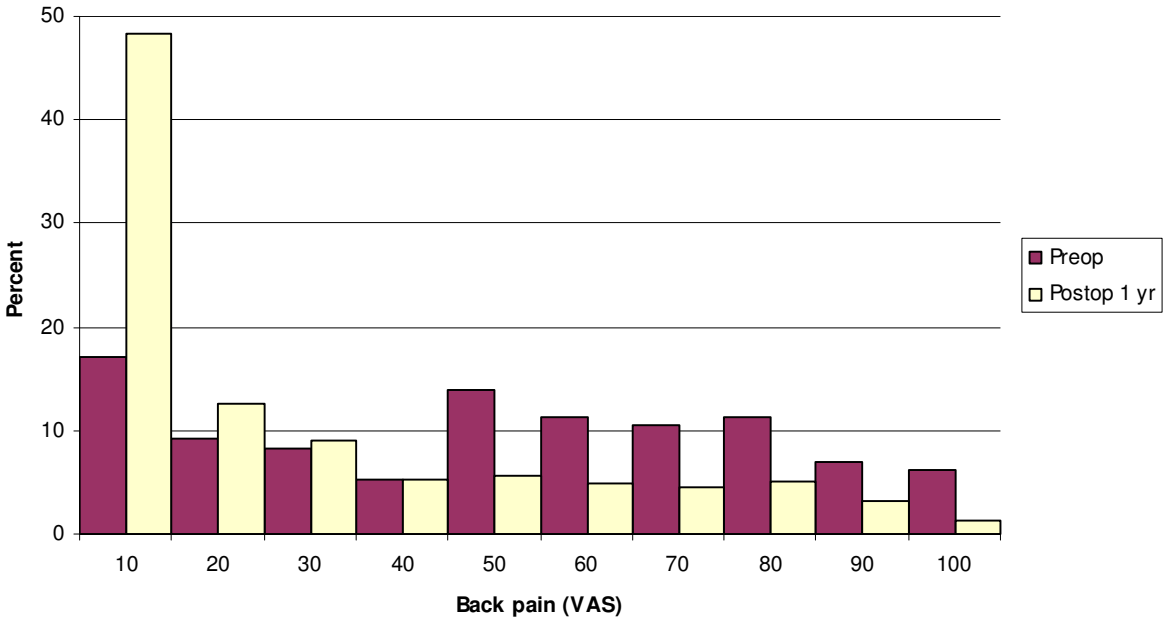


Fig 17. Back pain on the visual analog scale preoperatively and 1 year postoperatively in patients operated for lumbar disc herniation in 2008 (%).

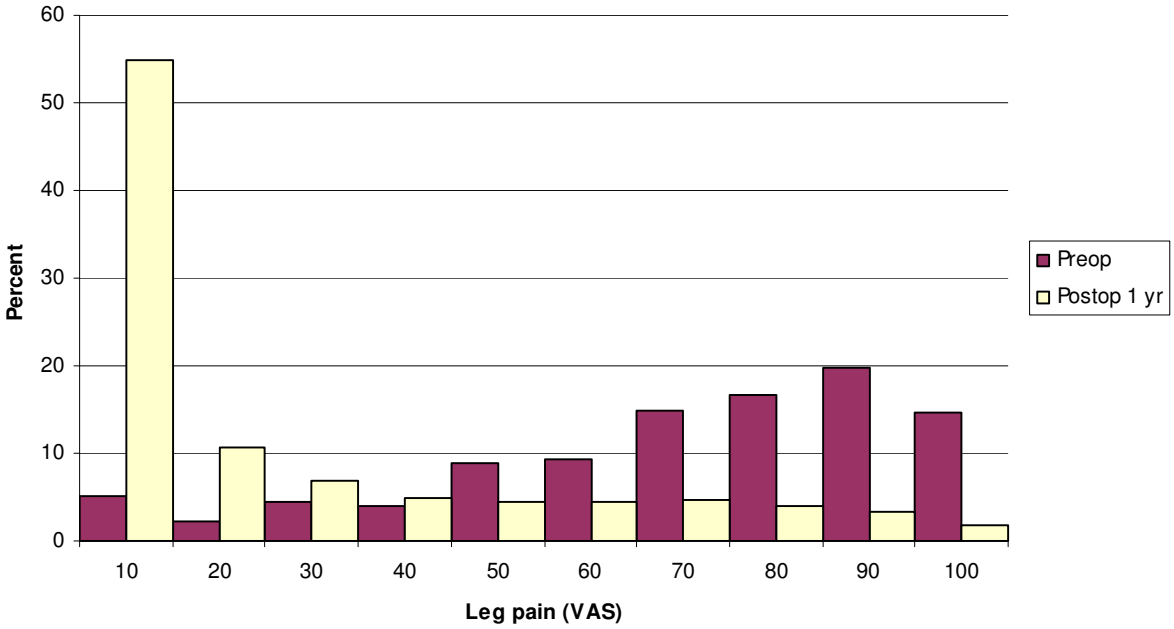


Fig 18. Leg pain on the visual analog scale preoperatively and 1 year postoperatively in patients operated for lumbar disc herniation in 2008 (%).

Perceived improvement relating to back pain: Completely pain-free 21%, significantly improved 43%, somewhat improved 16%, unchanged 7% and deteriorated 5%; 8% did not have preoperative back pain.

Perceived improvement relating to leg pain: Completely pain-free 33%, significantly improved 40%, somewhat improved 14%, unchanged 8% and deteriorated 5%; 2% had no preoperative leg pain.

Overall patient satisfaction with surgical outcome: 74% were satisfied, 17% uncertain and 9% dissatisfied.

Use of analgesics one year postoperatively: Regular 18%, intermittent 31%, none 51%.

Ability to walk one year postoperatively: < 100m 5%, 100-500m 9%, 500m-1 km 12%, >1 km 74%, a substantial improvement compared with preoperatively.

Figure 19 shows preoperative and one year postoperative status regarding health-related quality of life as measured with the SF-36. The improvement is significant in all domains except “General health”.

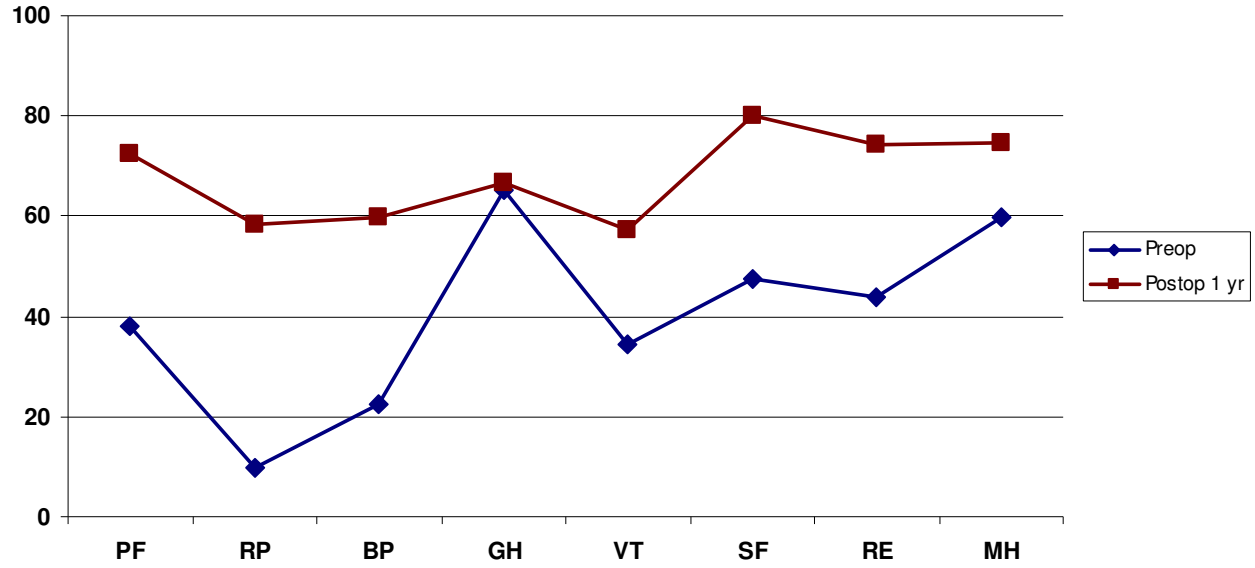


Fig 19. SF-36 preoperatively and 1 year postoperatively for patients operated for lumbar disc herniation in 2008.

The results from the EQ-5D-analysis are presented both as EQ-5D 5, i.e. the answers of the 5 questions included in the questionnaire, and also on the VAS scale, EQ-VAS. The results for lumbar disc herniation are as follows: Mean figure for EQ-5D 5 preoperatively: 0.25, 1 year postoperatively 0.70. Mean VAS preoperatively (max 100): 46, 1 year postoperatively 71.

Central spinal stenosis

This group includes 2058 patients with a mean age of 68 (0–93) years.

Gender distribution: 43% men, 57% women.

Surgical intervention: Decompression alone 70%, decompression + posterior instrumented fusion 20%, decompression + posterior non-instrumented fusion 3%, decompression + PLIF 1%, decompression + TLIF 1% and other interventions 4%.

Mean preoperative VAS for back pain was 56, compared with mean postoperative of 31. The corresponding figures for leg pain were 62 and 32 respectively. Figures 20 and 21 show pre- and postoperative VAS for back and leg pain, respectively.

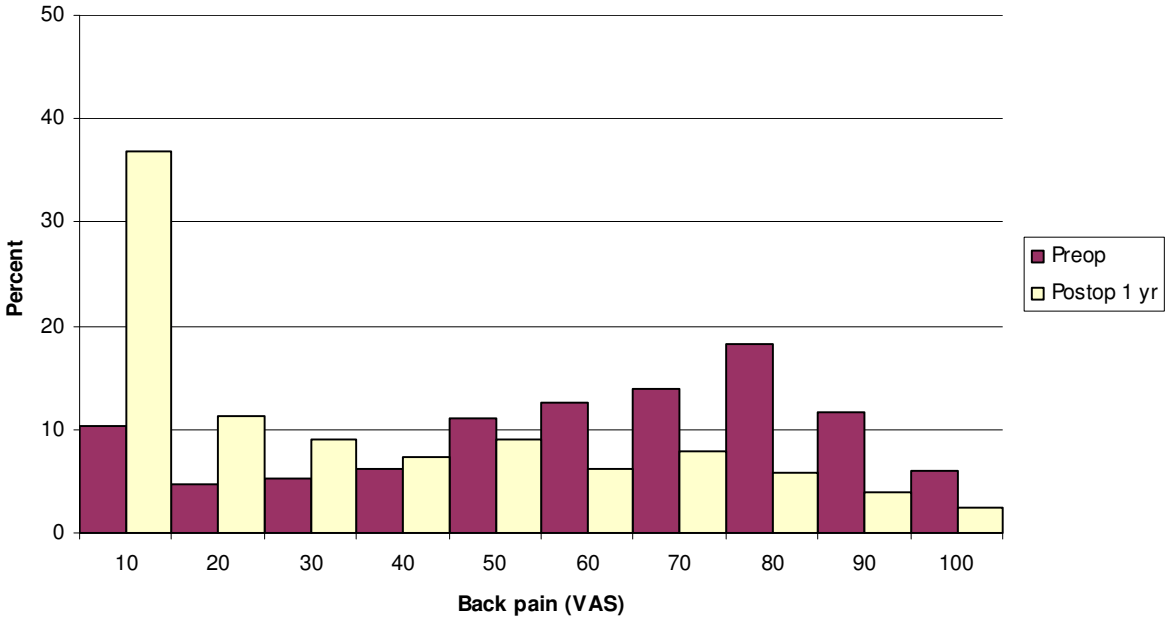


Fig 20. Back pain on the visual analog scale preoperatively and 1 year postoperatively in patients operated for lumbar central spinal stenosis in 2008 (%).

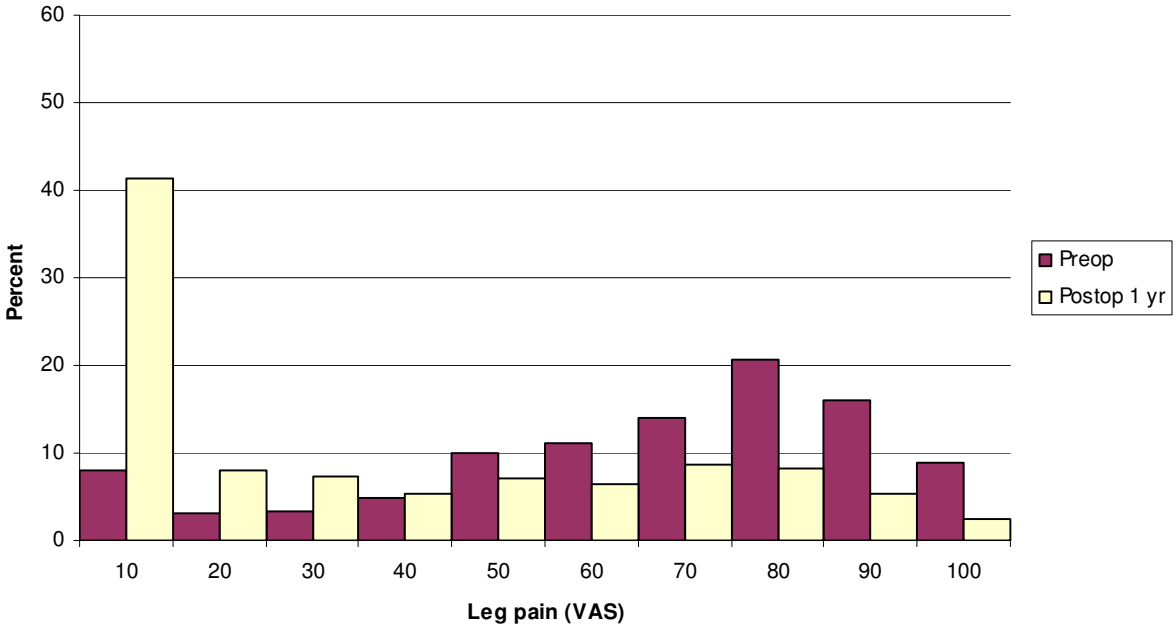


Fig 21. Leg pain on the visual analog scale preoperatively and 1 year postoperatively in patients operated for lumbar central spinal stenosis in 2008 (%).

One year postoperatively, 17% of patients felt they were completely pain-free, 37% significantly improved, 20% somewhat improved, 11% unchanged and 8% deteriorated with regard to back pain; 8% had no preoperative back pain. The corresponding figures for leg pain were 24% completely pain-

free, 29% significantly improved, 17% somewhat improved, 12% unchanged and 11% deteriorated. 7% reported no preoperative leg pain.

Overall patient satisfaction with the procedure was as follows: 65% satisfied, 22% uncertain and 13% dissatisfied with the surgical outcome.

Analgesic use one year postoperatively: Regular 29%, intermittent 33%, none 39%.

Ability to walk one year postoperatively: < 100m 18%, 100-500m 23%, 500m-1 km 17%, >1 km 43%, a substantial improvement compared with preoperatively.

Improvement of SF-36 score was also found one year postoperatively in the category central spinal stenosis in all aspects except "General health". The improvement was less pronounced than for disc herniation patients, but probably similar when adjusted for age; see figure 22.

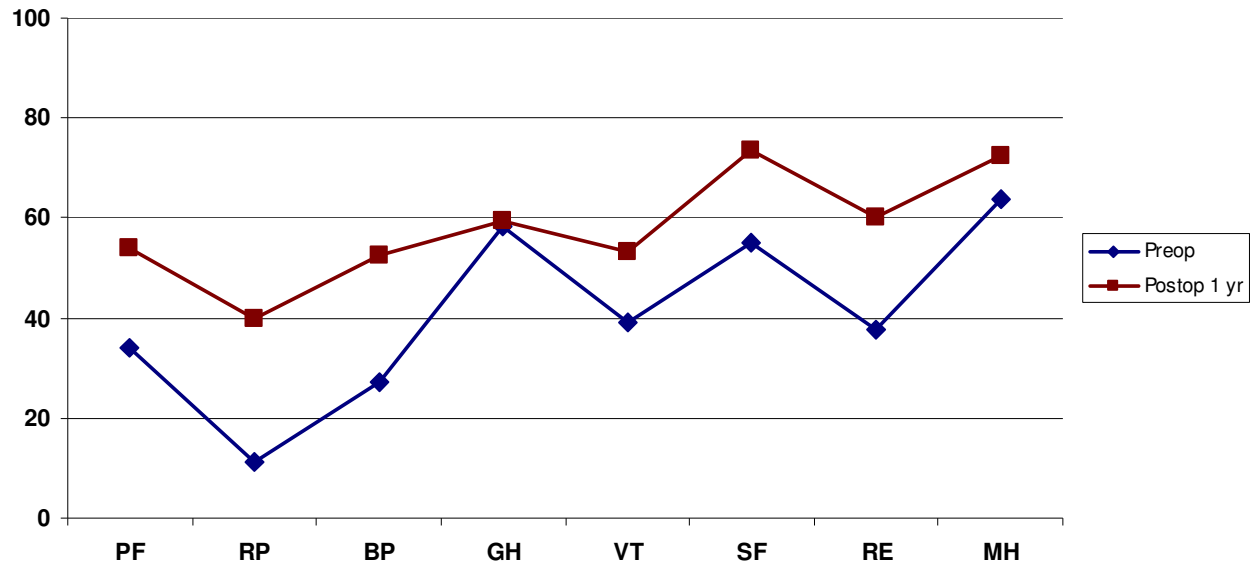


Fig 22. SF-36 preoperatively and 1 year postoperatively for patients operated for lumbar central spinal stenosis 2008.

Mean figure for EQ-5D 5 preoperatively: 0.34, 1 year postoperatively 0.62. Mean VAS preoperatively (max 100): 48, 1 year postoperatively 63.

Lateral spinal stenosis

This patient group included 327 patients with a mean age of 60 (4–88) years. Gender distribution was 51% men and 49% women. Decompression alone was used in 76% of cases, decompression + posterior fusion in 14% (11% instrumented and 3% non-instrumented), decompression + PLIF 2% and other procedures 8%.

Mean preoperative VAS for back pain was 52, compared with mean postoperative of 33. The corresponding figures for leg pain were 63 and 34 respectively. Figures 23 and 24 show the distribution of pre- and postoperative VAS for back and leg pain.

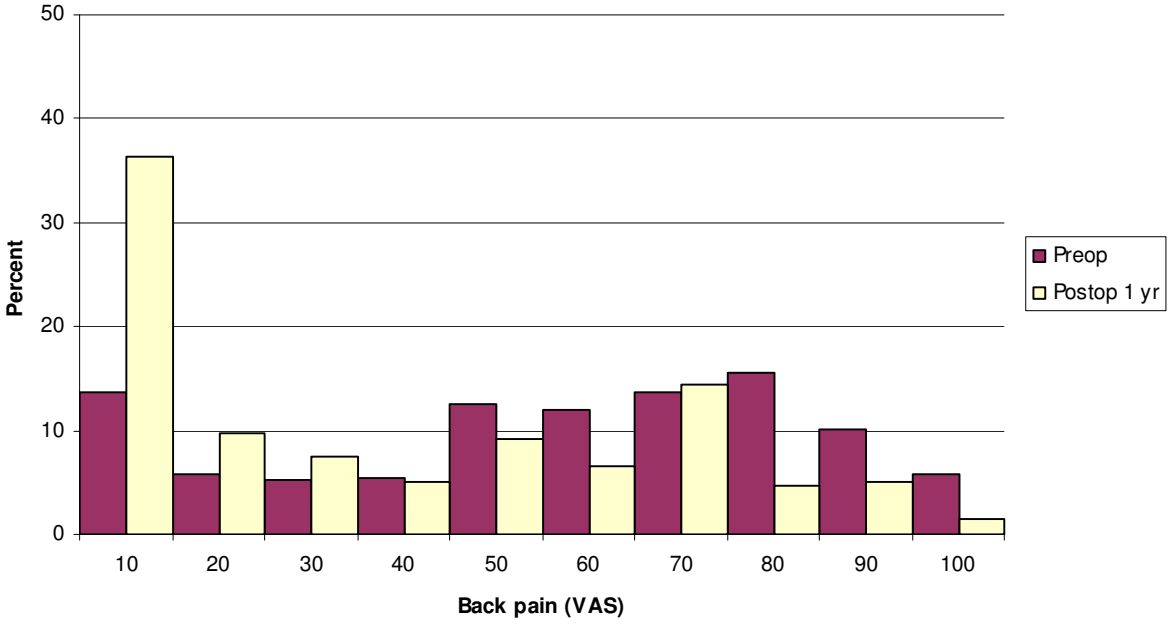


Fig 23. Back pain on the visual analog scale preoperatively and 1 year postoperatively in patients operated for lumbar lateral spinal stenosis in 2008 (%).

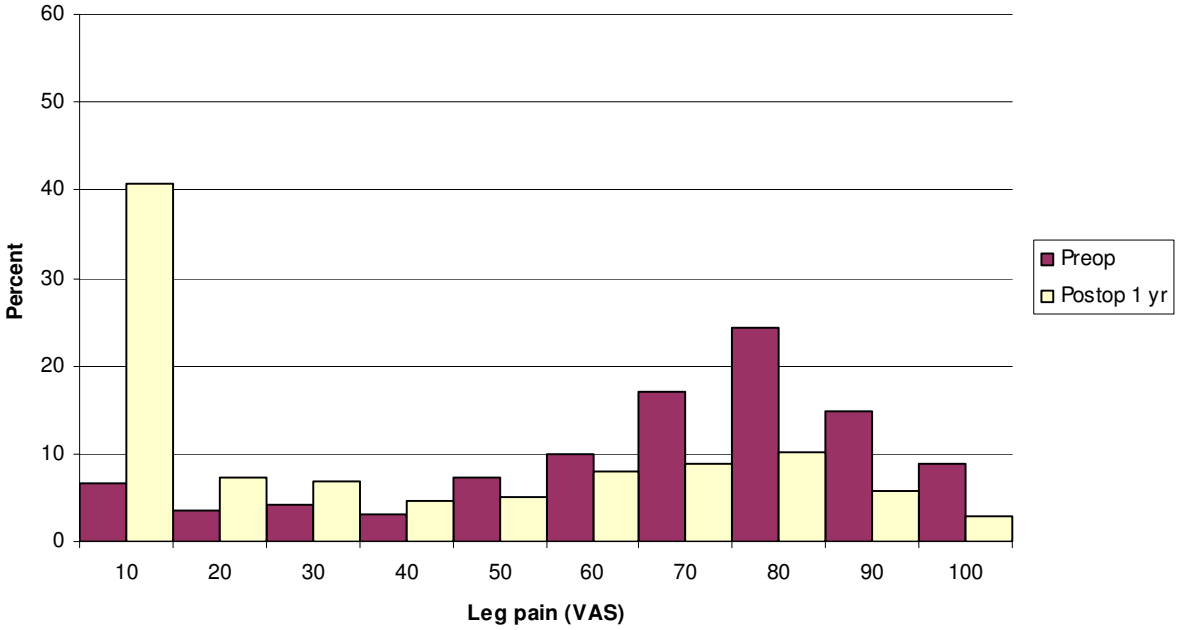


Fig 24. Leg pain on the visual analog scale preoperatively and 1 year postoperatively in patients operated for lumbar lateral spinal stenosis in 2008 (%).

One year postoperatively, 14% of patients were completely pain-free, 34% significantly improved, 20% somewhat improved,16% unchanged and 8% deteriorated with regard to back pain. 8% had no preoperative back pain. The corresponding figures for leg pain were 24% completely pain-free, 28% significantly improved, 20% somewhat improved, 12% unchanged and 13% deteriorated; 3% did not have leg pain previously.

Patient satisfaction with surgical outcome: 60% satisfied, 26% uncertain and 15% dissatisfied.

Medication use 1 year postoperatively: 32% regularly, 33% intermittently and 36% took no medication.

Ability to walk one year postoperatively: walking distance of < 100m 14%, 100–500m 19%, 500m–1 km 16% and > 1 km 50%.

The patient group operated for lateral spinal stenosis also showed improvement in SF-36 scores, though somewhat less pronounced; see figure 25.

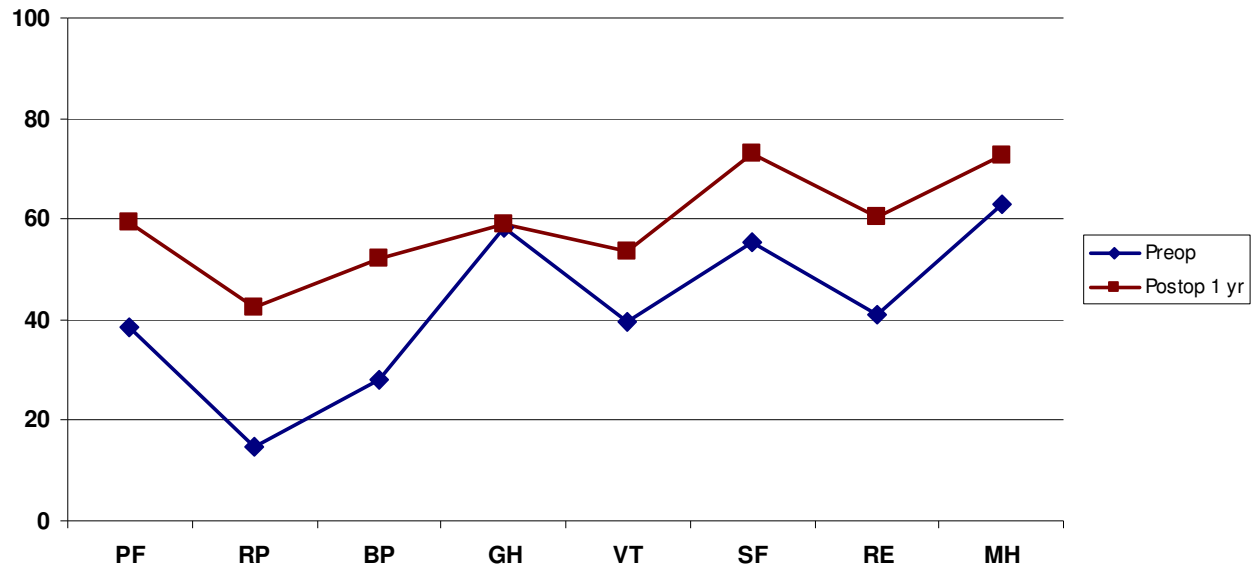


Fig 25. SF-36 preoperatively and 1 year postoperatively for patients operated for lumbar lateral spinal stenosis in 2008.

Mean figure for EQ-5D 5 preoperatively: 0.35, 1 year postoperatively 0.64. Mean VAS preoperatively (max 100): 48, 1 year postoperatively 64.

Spondylolisthesis

In all, 231 patients operated during the period for spondylolisthesis completed 1-year follow-up. Mean age was 50 (10–79) years, gender distribution 48% men and 52% women.

Among the patients with spondylolisthesis, 45% were operated with decompression and posterior instrumented fusion, 20% with posterior instrumented fusion alone, 14% with PLIF, 3% with decompression + PLIF, 5% with decompression + TLIF, 4% with decompression + posterior non-

instrumented fusion, 3% with posterior non-instrumented fusion, 2% with decompression alone, 2% 360º instrumented/global fusion and 2% other procedures.

Mean preoperative VAS for back pain was 59, compared with mean postoperative of 27. The corresponding figures for leg pain were 50 and 21 respectively. Figures 26 and 27 show preoperative and postoperative VAS relating to back and legs.

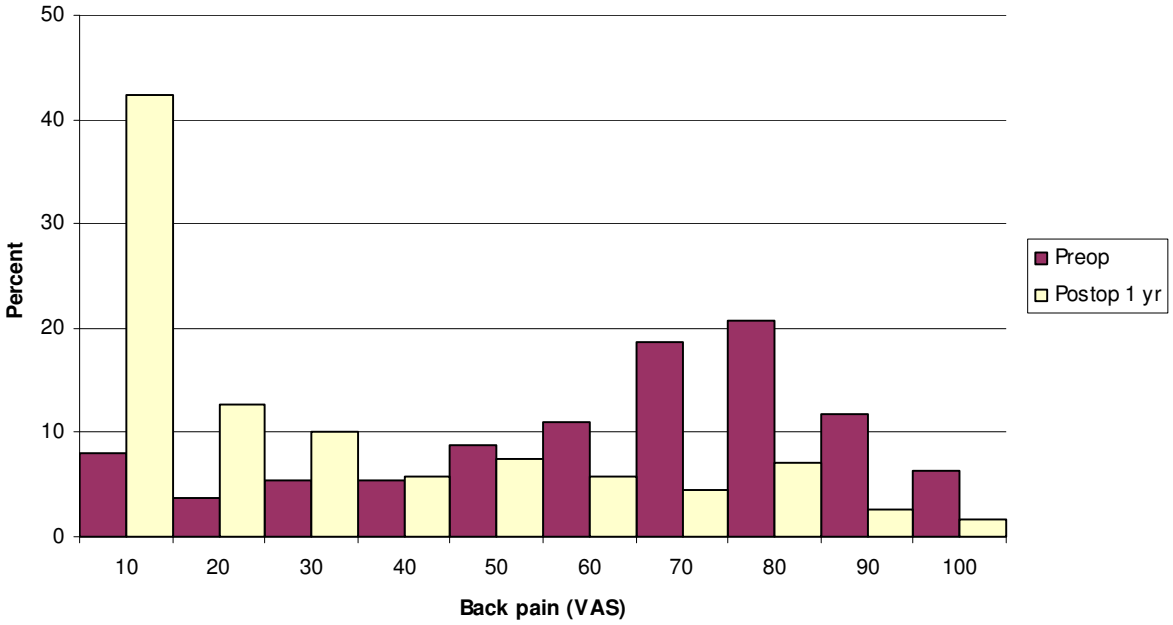


Fig 26. Back pain on the visual analog scale preoperatively and 1 year postoperatively in patients operated for spondylolisthesis in 2008 (%).

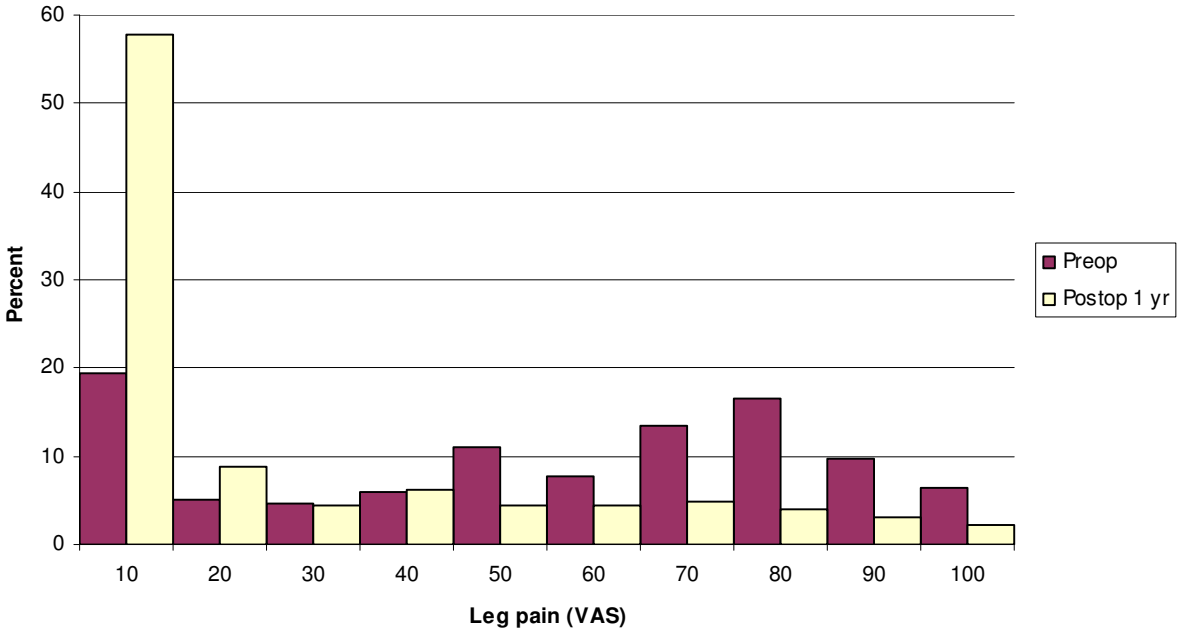


Fig 27. Leg pain on the visual analog scale preoperatively and 1 year postoperatively in patients operated for spondylolisthesis in 2008 (%).

At the 1-year follow-up, 16% of patients felt they were completely pain-free, 46% significantly improved, 18% somewhat improved, 6% unchanged and 9% deteriorated with regard to back pain; 5% did not have back pain previously. The corresponding figures for leg pain were 28% completely pain-free, 30% significantly improved, 15% somewhat improved, 8% unchanged and 7% deteriorated; 12% reported no preoperative leg pain.

Overall patient satisfaction with the operation: 76% satisfied, 12% uncertain and 12% dissatisfied.

Regular intake of analgesics one year postoperatively was reported by 24%, intermittent use by 32% and no intake of analgesics at all by 44%.

Ability to walk one year postoperatively: < 100m 9%, 100-500m 11%, 500m-1 km 12%, >1 km 68%, a substantial improvement compared with preoperatively.

Spondylolisthesis patients showed good improvement in their SF-36 scores one year postoperatively compared with preoperatively, see figure 28.

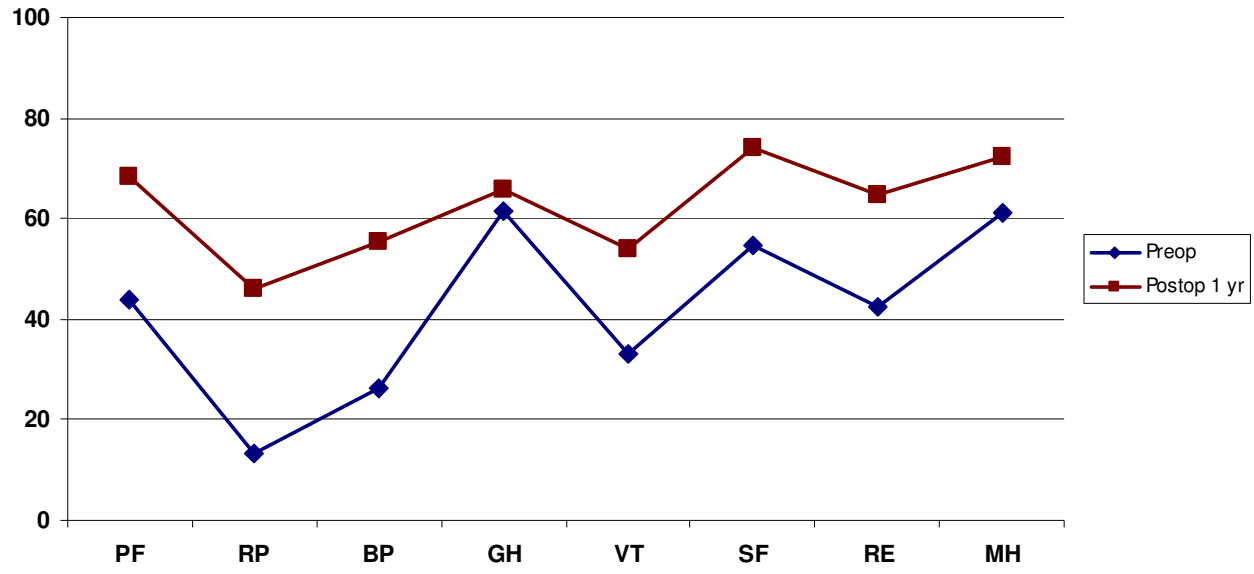


Fig 28. SF-36 preoperatively and 1 year postoperatively for patients operated for spondylolisthesis in 2008.

Mean value for EQ-5D preoperatively: 0.35, 1 year postoperatively 0.66. Mean VAS preoperatively (max 100): 47, 1 year postoperatively 68.

DDD (disc degenerative disorder)/segmental pain

In all, 1-year follow-up was completed by 529 patients operated during the period. Mean age was 46 (19–78) years, gender distribution 49% men and 51% women.

In 25% of cases patients with DDD were operated with posterior instrumented fusion, in 20% with PLIF, in 17% with disc prosthesis, in 13% with decompression + posterior instrumented fusion, in 7%

with decompression + TLIF, in 6% with TLIF, in 6% with decompression + PLIF, in 3% with posterior non-instrumented fusion and in 3% with other procedures.

Mean preoperative VAS for back pain was 63, compared with mean postoperative of 32. The corresponding figures for leg pain were 44 and 24 respectively. Figures 29 and 30 show pre- and postoperative VAS for back and leg pain.

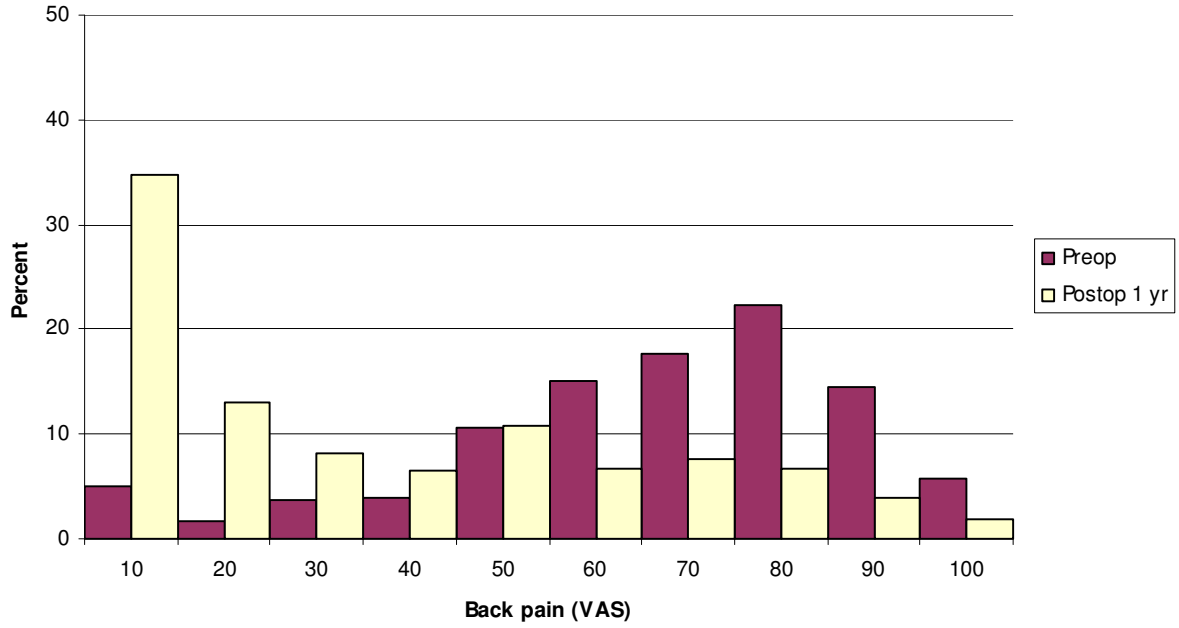


Fig 29. Back pain on the visual analog scale preoperatively and 1 year postoperatively in patients operated for DDD in 2008 (%).

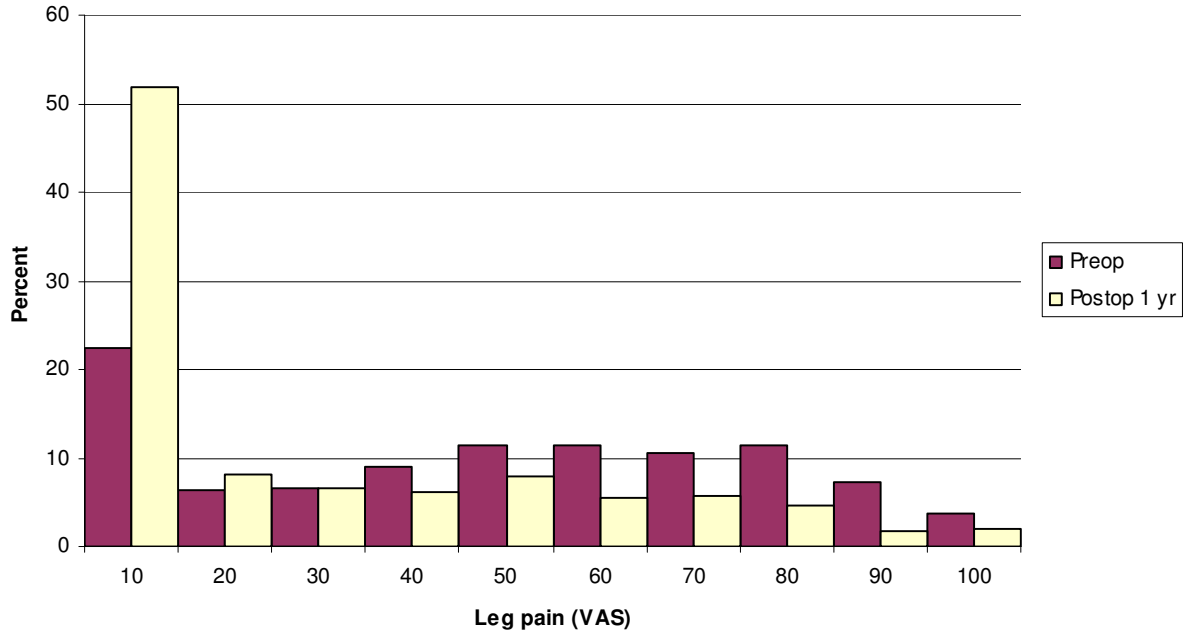


Fig 30. Leg pain on the visual analog scale preoperatively and 1 year postoperatively in patients operated for DDD in 2008 (%).

One year postoperatively, patients operated for DDD perceived back pain as follows: Completely pain-free 15%, significantly improved 45%, somewhat improved 24%, unchanged 9% and deteriorated 8%; 0.4% did not have back pain previously.

Corresponding figures for leg pain: Completely pain-free 23%, significantly improved 30%, somewhat improved 17%, unchanged 10% and deteriorated 9%. 12% reported no preoperative leg pain.

Regarding patient satisfaction with the operation, 71% were satisfied, 19% uncertain and 10% dissatisfied.

Among these patients, 27% took analgesics regularly one year postoperatively, 36% did so intermittently and 37% reported that they did not use any analgesics.

Ability to walk one year postoperatively: < 100m 5%, 100-500m 10%, 500m-1 km 16%, >1 km 69%, a substantial improvement compared with preoperatively.

Figure 31 shows the pre- and postoperative SF-36 profiles for patients operated for DDD; the profiles are similar to the other diagnoses. Both the physical and mental domains show improvement.

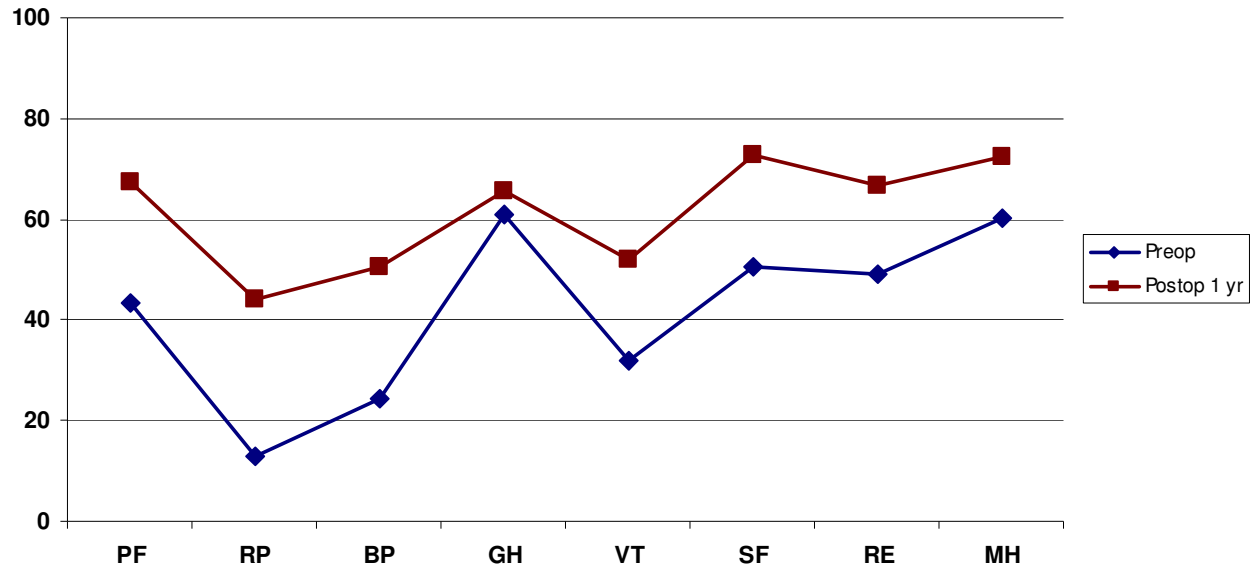


Fig 31. SF-36 preoperatively and 1 year postoperatively for patients operated for DDD in 2008

Mean figure for EQ-5D 5 preoperatively: 0.31, 1 year postoperatively 0.63. Mean value on the scale preoperatively (max 100): 44, 1 year postoperatively 63.

Oswestry Disability index, ODI, before and 1 year after surgery for all diagnoses

Below is a comparison of pre- and postoperative "disability" as measured by the Oswestry index. All diagnoses show a significant reduction in measured functional limitation; most pronounced is disc herniation, see Figure 32. A score of 0-20 is regarded as no or little "disability".

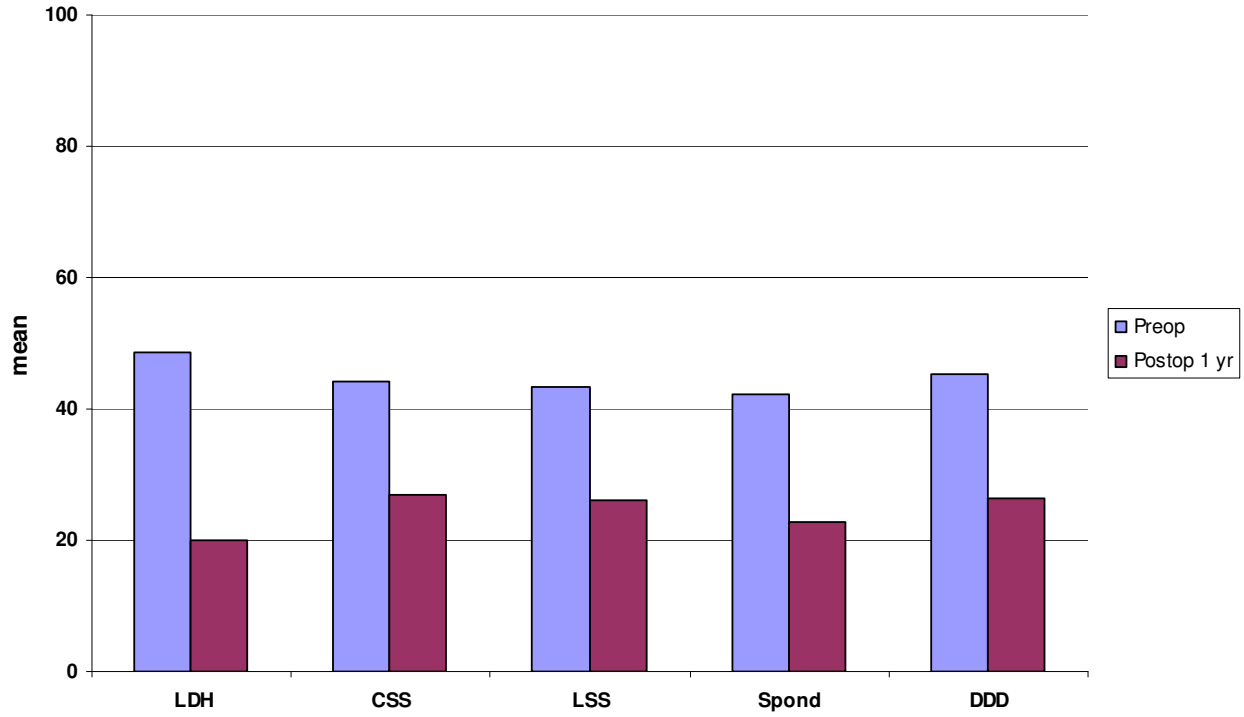


Fig 32. ODI score before and one year after lumbar spine surgery, related to diagnosis, for patients operated in 2008.

III. 2-year follow-up of lumbar spine procedures in Sweden in 2009

A total of 3171 patients operated on in 2007 have completed preoperative, 1-year and 2-year follow-up postoperative protocols. The most common diagnoses are lumbar disc herniation, 906, and central spinal stenosis, 1397 patients. In all, 230 patients had been operated for lateral spinal stenosis, 202 for spondylolisthesis and 358 for DDD 358. The remaining 78 had other diagnoses. Below is a comparison of several parameters assessed at 1-year and 2-year follow-up. Only patients who responded on all 3 occasions are included.

Table 1 presents pain on the VAS, diagnosis-related, over time.

Table 1. Pain on the VAS (mean), diagnosis-related.

	Back			**Leg**		
	Preop	**1 year**	**2 year**	**Preop**	**1 year**	**2 year**
Disc Herniation	44	22	21	65	19	18
Central stenosis	53	30	34	60	31	34
Lateral stenosis	53	30	32	64	30	32
Spondylolisthesis	62	29	27	54	25	25
DDD	64	32	32	44	24	24

Tables 2-6 present walking distance after the different procedures preoperatively as well as 1 and 2 years postoperatively.

Table 2. Walking distance, disc herniation (%)

	Preoperatively	**1 year**	**2 year**
< 100m	31	3	3
100m– 500m	20	7	7
500m– 1 km	16	9	9
>1 km	34	80	82

Table 3. Walking distance, central spinal stenosis (%)

	Preoperatively	**1 year**	**2 year**
< 100m	40	19	21
100m– 500m	32	21	20
500m– 1 km	14	16	15
>1 km	14	44	44

Table 4. Walking distance, lateral spinal stenosis (%)

	Preoperatively	**1 year postop**	**2 years postop**
< 100m	33	8	12
100m– 500m	32	18	19
500m– 1 km	15	18	16
>1 km	21	56	54

Table 5. Walking distance, spondylolisthesis (%)

	Preoperatively	**1 year postop**	**2 years postop**
< 100m	19	7	8
100m– 500m	24	14	12
500m– 1 km	20	10	11
>1 km	38	69	69

Table 6. Walking distance, DDD (%)

	Preoperatively	**1 year postop**	**2 years postop**
< 100m	15	7	10
100m– 500m	23	12	8
500m– 1 km	25	15	14
>1 km	38	66	68

Tables 7-11 show consumption of analgesics preoperatively and 1 and 2 years postoperatively, related to diagnosis for surgery.

Table 7. Consumption of analgesics, lumbar disc herniation, preoperatively, 1 and 2 years postoperatively (%).

	Preoperatively	**1 year postop**	**2 years postop**
Regular	58	15	15
Intermittent	30	30	31
None	12	55	54

Table 8. Consumption of analgesics, central spinal stenosis preoperatively, 1 and 2 years postop (%).

	Preoperatively	**1 year postop**	**2 years postop**
Regular	51	29	32
Intermittent	31	32	30
None	18	39	38

Table 9. Consumption of analgesics, lateral spinal stenosis preoperatively, 1 and 2 years postop (%).

	Preoperatively	**1 year postop**	**2 years postop**
Regular	52	26	28
Intermittent	34	36	38
None	14	38	35

Table 10: Consumption of analgesics, spondylolisthesis preoperatively, 1 and 2 years postop (%).

	Preoperatively	**1 year postop**	**2 years postop**
Regular	41	20	24
Intermittent	37	37	30
None	22	43	46

Table 11: Consumption of analgesics, segmental pain preoperatively, 1 and 2 years postop (%).

	Preoperatively	**1 year postop**	**2 years postop**
Regular	52	29	29
Intermittent	37	38	34
None	12	33	38

Table 12 presents patient-assessed satisfaction with surgical outcome after 1 and 2 years.

Table 12: Attitude toward surgical outcome 1 and 2 years postop, diagnosis-related.

	1 year postop			**2 years postop**		
	Satisfied	**Uncertain**	**Dissatisfied**	**Satisfied**	**Uncertain**	**Dissatisfied**
Disc Herniation	81	14	5	81	14	6
Central stenosis	65	23	12	63	25	13
Lateral stenosis	64	27	9	66	23	11
Spondylolisthesis	72	19	10	72	18	10
DDD	72	20	9	73	17	11

Tables 13-14 and figure 33 present quality of life as measured by EQ-5D and by VAS. All patient groups experience a significant improvement in quality of life postoperatively.

Table 13: EQ-5D means preoperatively, 1 year and 2 years postop, diagnosis-related.

	Preop	1 year postop	2 years postop
Disc Herniation	0.29	0.74	0.75
Central spinal stenosis	0.38	0.65	0.62
Lateral spinal stenosis	0.33	0.67	0.63
Spondylolisthesis	0.37	0.64	0.66
DDD	0.34	0.63	0.63

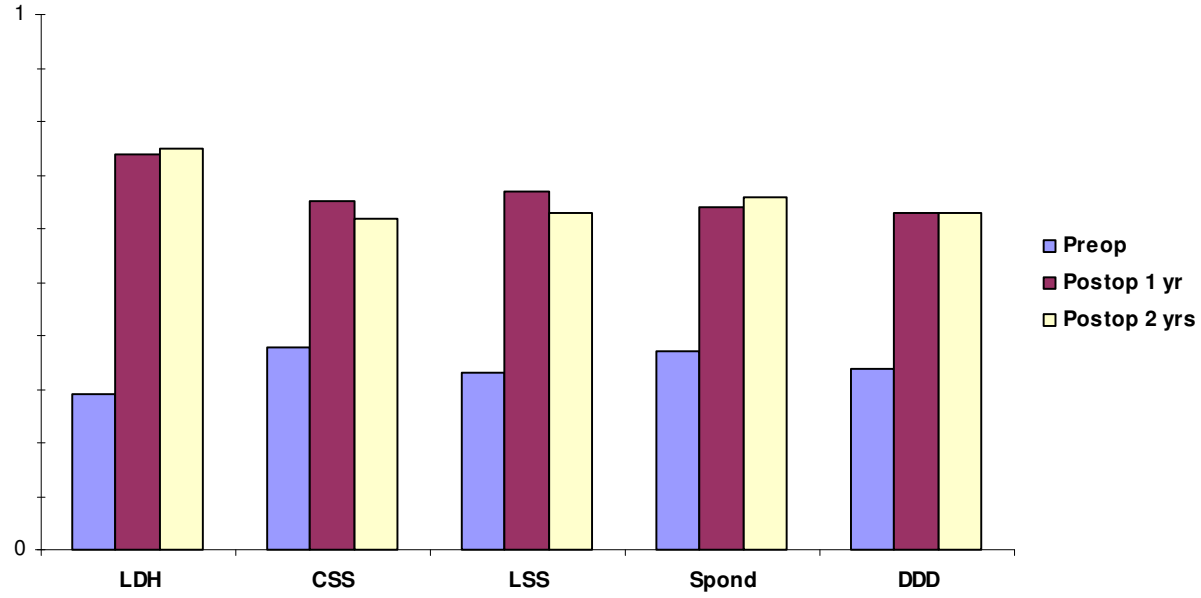


Fig 33. Quality of life preoperatively, 1 and 2 years postoperatively, as measured by EQ-5D.

Table 14: EQ-5D health assessment according to the VAS, means.

	Preop	1 year postop	2 years postop
Disc Herniation	45	73	73
Central spinal stenosis	49	65	63
Lateral spinal stenosis	48	66	63
Spondylolisthesis	47	66	66
DDD	47	67	66

Oswestry Disability index, ODI, preoperatively, 1 and 2 years post-operatively for all diagnoses

Table 15. ODI results preoperatively, 1 and 2 years after lumbar spine surgery, diagnosis-related.

	Preoperatively	**1 year postop**	**2 years postop**
Disc Herniation	48	18	17
Central spinal stenosis	44	26	28
Lateral spinal stenosis	44	24	27
Spondylolisthesis	44	26	24
DDD	45	27	26

IV. 5-year follow-up of lumbar spine procedures in Sweden in 2009

A total of 1473 patients completed 1, 2 and 5-year follow-up after having undergone lumbar spine surgery in 2004. The most common diagnoses are lumbar disc herniation, 510 and central spinal stenosis, 521 patients. In all, 96 patients had been operated for lateral spinal stenosis, 96 for spondylolisthesis and 189 for segmental pain. The remaining 61 had other diagnoses. Below is a comparison of several parameters at 1, 2 and 5-year follow-up. Only patients who responded on all 4 occasions are included.

Table 16 presents pain on the VAS, diagnosis-related, over time.

Table 16. Pain on the VAS (mean), diagnosis-related.

	Back				**Leg**			
	Preop	**1 year**	**2 years**	**5 years**	**Preop**	**1 year**	**2 years**	**5 years**
Disc Herniation	46	21	23	19	67	19	21	18
Central stenosis	55	33	35	33	63	34	35	34
Lateral stenosis	54	31	33	29	63	35	39	29
Spondylolisthesis	53	25	28	28	51	25	26	29
DDD	64	32	33	32	41	23	24	23

Tables 17-21 present walking distance after the different procedures preoperatively as well as 1, 2 and 5 years postoperatively.

Table 17. Walking distance, disc herniation (%)

	Preoperatively	**1 year**	**2 years**	**5 years**
< 100m	36	4	2	4
100m– 500m	20	8	8	8
500m– 1 km	16	9	10	8
>1 km	29	79	78	80

Table 18. Walking distance, central spinal stenosis (%)

	Preoperatively	**1 year**	**2 years**	**5 years**
< 100m	43	16	19	26
100m– 500m	33	21	18	21
500m– 1 km	12	16	18	12
>1 km	12	45	41	38

Table 19. Walking distance, lateral spinal stenosis (%)

	Preoperatively	**1 year**	**2 years**	**5 years**
< 100m	30	10	13	16
100m– 500m	32	16	21	14
500m– 1 km	17	17	15	16
>1 km	21	55	51	54

Table 20. Walking distance, spondylolisthesis (%)

	Preoperatively	**1 year**	**2 years**	**5 years**
< 100m	12	8	6	10
100m– 500m	26	8	8	8
500m– 1 km	24	14	15	16
>1 km	38	70	71	63

Table 21. Walking distance, DDD (%)

	Preoperatively	1 year	**2 years**	**5 years**
< 100m	19	5	6	9
100m– 500m	18	10	11	10
500m– 1 km	23	19	14	11
>1 km	39	67	63	68

Tables 22-26 show consumption of analgesics preoperatively and 1, 2 and 5 years postoperatively, related to diagnosis for surgery.

Table 22. Consumption of analgesics, lumbar disc herniation, preoperatively, 1, 2 and 5 years postoperatively (%).

	Preoperatively	**1 year**	**2 years**	**5 years**
Regular	58	12	13	16
Intermittent	31	32	31	33
None	11	55	55	51

Table 23. Consumption of analgesics, central spinal stenosis preoperatively, 1, 2 and 5 years postop (%).

	Preoperatively	**1 year**	**2 years**	**5 years**
Regular	55	26	29	33
Intermittent	28	37	36	31
None	18	36	35	33

Table 24. Consumption of analgesics, lateral spinal stenosis preoperatively, 1, 2 and 5 years postop (%).

	Preoperatively	**1 year**	**2 years**	**5 years**
Regular	57	34	37	29
Intermittent	34	30	31	31
None	9	35	32	35

Table 25. Consumption of analgesics, spondylolisthesis preoperatively, 1, 2 and 5 years postop (%).

	Preoperatively	**1 year**	**2 years**	**5 years**
Regular	39	16	19	26
Intermittent	42	33	33	31
None	19	51	48	40

Table 26. Consumption of analgesics DDD preoperative, 1 2 and 5 years postop (%).

	Preoperatively	**1 year**	**2 years**	**5 years**
Regular	52	29	27	32
Intermittent	37	34	34	33
None	11	37	37	34

Table 27 presents patient-assessed satisfaction with surgical outcome after 1, 2 and 5 years.

Table 27. Attitude toward surgical outcome 1, 2 and 5 years postop, diagnosis-related.

	1 year postop			**2 years postop**			**5 ye**	
	Satisfied	**Uncertain**	**Dissatisfied**	**Satisfied**	**Uncertain**	**Dissatisfied**	**Satisfied**	**Un**
Disc herniation	80	13	4	79	12	6	83	
Central stenosis	65	21	10	62	21	12	61	
Lateral stenosis	70	16	12	67	20	13	63	
Spondylolisthesis	67	25	4	70	19	8	64	
DDD	72	17	9	67	19	9	62	

Tables 28-29 and figure 34 present quality of life as measured by EQ-5D and by VAS. All patient groups experience a significant improvement in quality of life postoperatively.

Table 28. EQ-5D means preoperatively, 1, 2 and 5 years postop, diagnosis-related.

	Preoperatively	**1 year postop**	**2 years postop**	**5 years postop**
Disc Herniation	24	74	73	75
Central stenosis	36	63	61	61
Lateral stenosis	31	59	62	67
Spondylolisthesis	34	68	73	67
DDD	32	63	63	61

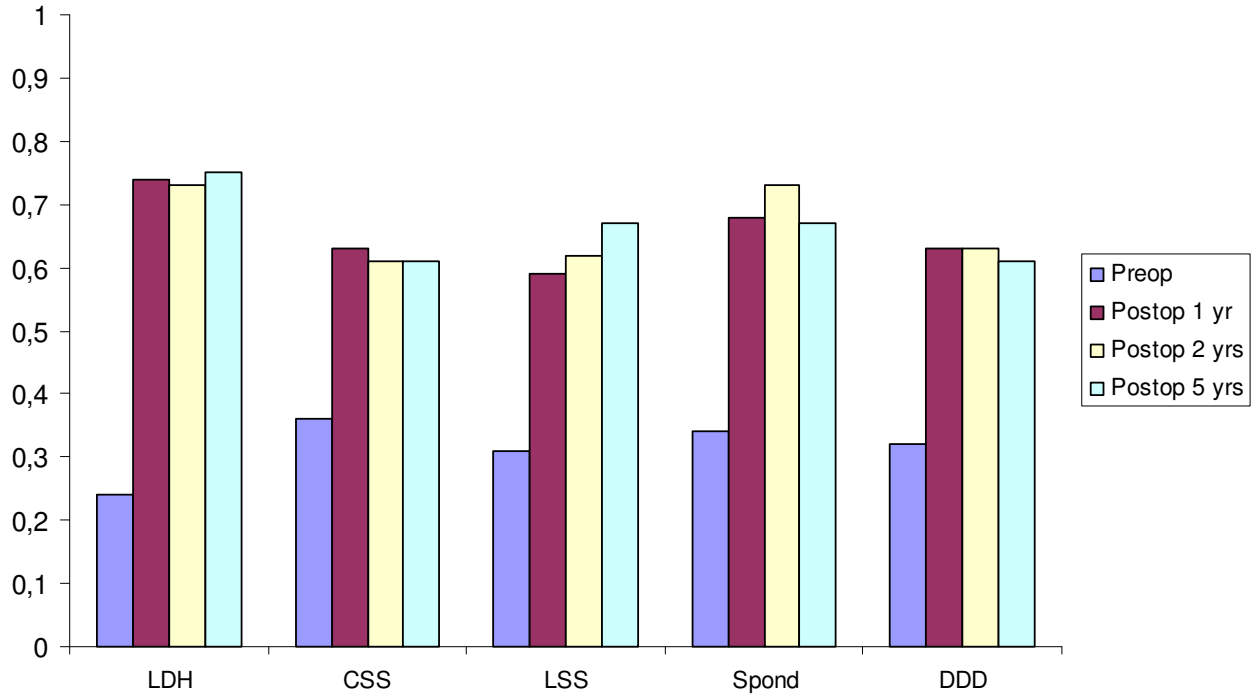


Fig 34. Quality of life preoperatively, 1 2 and 5 years postoperatively, as measured by EQ-5D.

Table 29. EQ-5D health assessment according to the VAS, means.

	Preoperatively	**1 year postop**	**2 years postop**	**5 years postop**
Disc Herniation	45	74	73	74
Central stenosis	48	63	63	59
Lateral stenosis	44	63	64	63
Spondylolisthesis	52	68	69	66
DDD	44	63	63	63

V. Improved surgical outcome for lumbar disc herniation

A case mix analysis of lumbar disc herniation treated in the public and private hospital setting

We have previously evaluated lumbar disc herniation surgical outcomes in three reports, 2005, 2006 and 2008. We analyzed the outcomes from a gender perspective, compared the results at departments with high and low surgical volumes, compared private spine clinics with public county and university hospitals, compared surgical methods and searched for predictive factors. We have drawn the following preliminary conclusions:

1. **Preoperative duration of pain is the single most important known predictive factor for final outcome regarding pain and quality of life.**

2. **Smokers have a significantly poorer outcome.**

3. **Women have poorer quality of life and more preoperative pain and do not achieve outcomes as good as men, as measured by such variables. However, women are as satisfied with the surgery as men after one year.**

4. **Departments and clinics with few reported lumbar disc herniation surgeries have worse outcomes than departments and clinics with a high reported surgical volume.**

5. **Private clinics do not show better outcomes than county hospitals and university hospitals in terms of improvement.**

6. **However, private clinics achieve better final outcomes, probably due to a different case mix (more favorable patient base) at these clinics compared with public hospitals.**

7. **Choice of surgical technique, conventional or microscopic, has no substantial impact on final outcome.**

As a result of these findings, in the 2008 report we formulated the following recommendations to healthcare authorities, administrators and colleagues:

1. **Reduce the waiting time for work-up and surgery for lumbar disc herniation.**

2. **Smoking cessation before disc herniation surgery.**

3. **Centralize disc herniation surgery in general; departments and clinics with fewer than 20 procedures/year should consider referral to centers with a higher surgical volume.**

These recommendations, based on extensive analysis of our register data, can be implemented. We interpret the situation as one in which attitudes, organization/planning and resource utilization in both primary care and specialist care are important.

In this year's analysis, we examine the performance of private clinics and evaluate whether our recommendation to centralize disc herniation surgery has had any effect.

In the text below, we use the following concepts, which should be clearly defined:

1. Improvement = difference between value at 1-year follow-up and preoperative value, e.g.,. VAS (Visual analog scale) for leg pain and EQ-5D for quality of life.
2. Final outcome = value of e.g., VAS for leg pain or self-rated improvement of back pain at 1-year follow-up.
3. Public hospital/clinic = local hospital + county hospital + university hospital.
4. Private clinic = medical center owned and run by private owner(s)
5. Private patient = patient who finances surgery with personal resources, through a company or private health insurance.
6. Public patient = patient who finances surgery with public funds and undergoes surgery at a public hospital or private clinic (via healthcare guarantee or free choice of care).

Disc herniation surgery at private clinics

In earlier reports (2006 and 2008) we showed that private spine clinics have significantly better results than public hospitals. However, the results are similar in terms of improvement based on preoperative values. Because of this finding, combined with the gradual increase of private clinics' share of degenerative lumbar spine surgery in the 2000s (figure 35), it is important to further analyze the differences and their causes. The occurrence of more men, higher preoperative quality of life, more patients with short duration of pain and fewer smokers in private clinics are probable partial explanations for the better outcomes. We have also put forward the hypothesis that private paying patients and patients with private health insurance in private clinics may be a group with positive predictors that also contribute to the better outcomes.

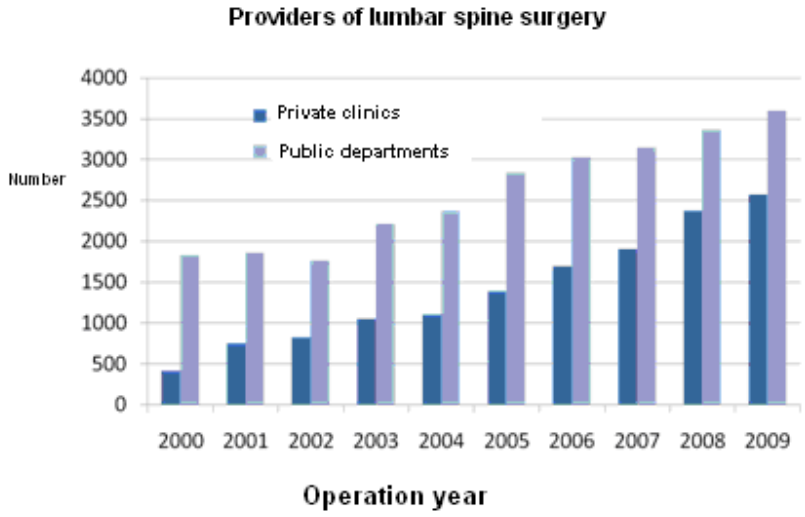


Fig 35. Proportion of degenerative lumbar spine surgery carried out each year by private clinics and public hospitals.

Beginning in 2008, all patients are asked in the preoperative form how their surgery was financed, i.e., with public or private (including health insurance) funds. The private back clinics have carried out a total of 4749 lumbar spine surgeries since 2008, of which 611 (13%) were financed with private (mainly private health insurance) funds. Of the total of 906 lumbar disc herniation surgeries, 212 (25%) were privately financed.

Material

For this analysis, we limited the selection to all operations carried out through April 1, 2009 to allow the 1-year follow-up to be carried out with a reasonable margin, figure 36.

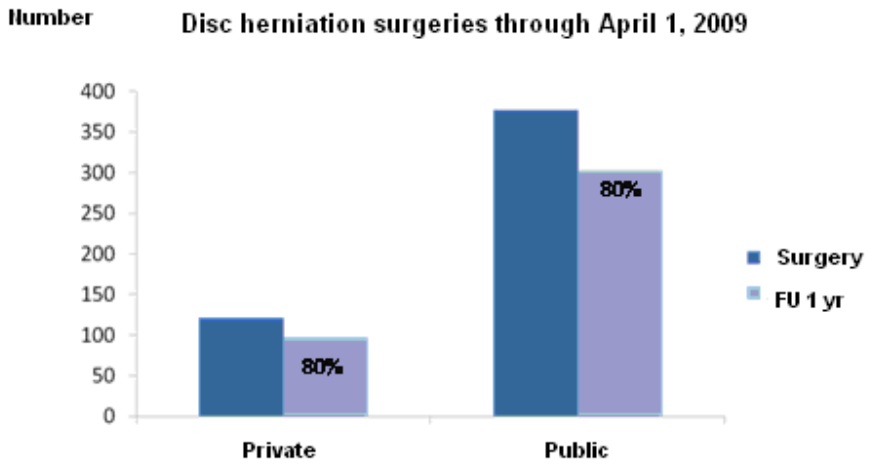


Fig 36. Private and publicly financed lumbar disc herniation surgeries and percentage followed up after 1 year (FU 1 year).

Table 30 shows the difference in patient profile between privately and publicly financed patients: the private group includes significantly more men, fewer smokers, fewer unemployed and more with short duration of pain than the public group.

Table 30. Patient profile of privately financed and public financed lumbar disc herniation surgeries, respectively.

	Private	Public	Chi2/T-test
Percentage (%)			
Men	73	57	0.002
Smokers	11	18	ns
Heavy work	17	17	ns
Unemployment	1	8	0.01
Sick leave	32	32	ns
Sick leave < 3 months	20	21	ns
Sick leave >3 months	30	15	0.0001
Analgesics	51	62	0.045
BMO	26	26	ns
Age (years)	46	44	ns

Table 31 presents preoperative pain and quality of life. Degree of leg pain is similar in public and private patients, but quality of life is better in the private group.

Table 31. Preoperative pain and quality of life in private and publicly financed disc herniation patients

	Private	Public	Mann-Whitney
Back pain (VAS)	36	41	0.02
Leg pain (VAS)	64	67	ns
Quality of life (EQ-5D)	0.38	0.29	0.003

Results

Tables 32, 33 and 34 present the results at 1-year follow-up. No significant difference in improvement can be seen as measured by the VAS for back and leg pain or the EQ-5D for quality of life (see table 33). However, the final outcome is significantly better in certain aspects for the private group. These parameters include leg pain as measured by the VAS and self-rated improvement in leg pain, as well as consumption of analgesics and return to work rate (see Table 32).

Table 32. Results at 1-year follow-up.

	Private	Public	Chi2
Percentage (%)			
Back pain			
No improvement or much better	84	79	ns
Leg pain			
No improvement or much better	90	79	0.03
Sick leave < 3 months postop	39	34	ns
Back to work full time	90	75	0.01
Sick leave now due to back problems	0	4	ns
Satisfied with treatment outcome	91	82	ns
Analgesics	0.5	6	0.002

Table 33. Improvement of pain (VAS) and quality of life (EQ-5D) after 1 year.

	Private	Public	Mann-Whitney
Back pain	21	21	ns
Leg pain	54	48	ns
Quality of life	0.44	0.45	ns

Table 34. Pain (VAS 0-100, high value is worse) and quality of life (EQ-5D 0-1, high value is better) after 1 year.

	Private	Public	Mann-Whitney
Back pain	14	21	0.03
Leg pain	10	19	0.05
Quality of life	0.84	0.73	0.0001

In summary, this analysis shows that the final outcome of lumbar disc herniation surgery in private clinics is better for privately or insurance-financed patients than for publicly financed patients, but not in terms of relative improvement. This appears to be an effect of a better starting point for private patient, e.g., regarding quality of life. However, the better final outcome for leg pain may mainly be the result of a larger improvement, although the difference in improvement between the groups is not significant. Circumstances that at least partly explain the differences are that the private group contains significantly more men, which we showed in the 2006 report achieve slightly better outcomes for disc herniation surgery than women. Moreover, the private group included significantly fewer smokers, which we showed in the 2008 report was important for the outcome of disc herniation surgery. When

these variables are weighted in a multivariate logistic regression analysis, only duration of leg pain remains as independently influencing the outcome (OR 1.7, CI 95% 1.2-2.3). See table 35.

Table 35. Multivariate logistic regression analysis of predictive factors.

	Significance	Odds ratio (OR)	C195%
Gender	0.9	-	+/-0
Smoking	0.9	-	+/-0
Financing	0.1	-	+/-0
Duration of leg pain	0.001	1.7	1.2-2.3

The previous analysis of the result of disc herniation surgery has been limited to publicly and privately financed surgery in private hospitals. With this perspective, we have assumed that all factors other than the patient-specific characteristics are as similar as possible; i.e., we assumed that surgery, other treatment and care are the same for both the public and private patient groups.

Publicly financed disc herniation surgeries

Since the outcome differences between the private and public patient groups, although significant, are relatively small and hardly exceed the so-called MCID value (minimum clinically important difference) for the variables studied, and in addition, the private patient group represents only 24% of the basis of this analysis, it seems unlikely that this is the only explanation for the better outcomes achieved at the private spine clinics, according to some calculation methods, when compared with the public hospitals. It is therefore of interest to compare the results for the public patient group operated in the private spine clinics, with the public patient group operated in the public hospitals. As a basis for this comparison, we used the publicly financed disc herniation surgeries carried out from 2008 until April 1, 2009 (Figure 37).

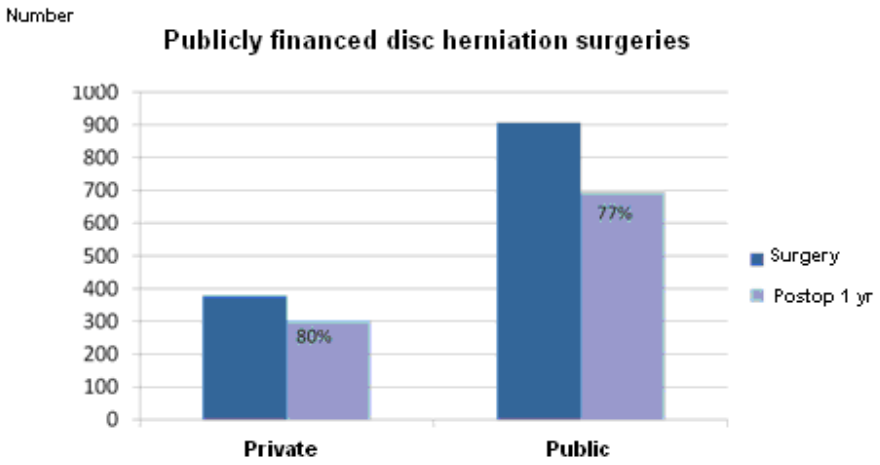


Fig 37. Publicly financed disc herniation surgeries at private clinics and public hospitals and 1-year follow-up rate (FU 1 year).

Tables 36 and 37 present preoperative data, which indicate that leg pain, as measured by the VAS, is of the same intensity, while quality of life as measured by the EQ-5D, is significantly higher in the private clinic group. The differences in patient profile with regard to gender, smoking, etc. are small. In particular, we note that there is no significant difference in preoperative duration of leg pain (duration).

Table 36. Patient profile in publicly financed disc herniation surgeries at private clinics and public hospitals, respectively.

	Private	**Public**	**Chi/T-test**
Percentage (%)			
Men	57	52	ns
Smokers	18	22	ns
Heavy work	17	19	ns
Unemployment	8	12	0.02
Sick-leave	32	39	0.01
Sick-leave <3 months	21	18	ns
Leg pain <3 months	15	20	ns
Analgesic	61	64	ns
BMO	26	26	ns
Age (Year)	46	44	ns

Table 37. Preoperative symptoms of publicly financed disc herniation patients at private clinics and public hospitals, respectively.

	Private	**Public**	**Mann-Whitney**
Back pain	43	48	0.02
Leg pain	67	68	ns
Quality of life (EQ-5D)	0.29	0.23	0.01

The improvement is equal in the two groups, while the end result is significantly better for patients who undergo surgery in private clinics for all measured variables except self-rated improvement of leg pain (tables 38, 39 and 40).

Table 38. Improvement of pain (VAS) and quality of life (EQ-5D) after 1 year.

	Private	**Public**	**Mann-Whitney**
Back pain	21	21	ns
Leg pain	48	46	ns
Quality of life	0.45	0.47	ns

Table 39. Pain (VAS) and quality of life (EQ-5D) after 1 year.

	Private	Public	Mann-Whitney
Back pain	21	26	0.02
Leg pain	19	22	0.02
Quality of life	0.73	0.69	0.045

Table 40. Self-rated change in pain, return to work, satisfaction and analgesics use after 1 year.

	Private	Public	Chi2
Percentage (%)			
Back pain			
No improvement or much better	79	72	0.01
Leg pain			
No improvement or much better	80	75	ns
Sick leave < 3 months postop	92	78	0.001
Back to work full time	74	59	0.001
Sick leave now due to back problems	1	7	0.001
Satisfied with treatment outcome	81	74	0.01
Analgesics	11	14	0.02

In summary, the analysis shows that the same kind of difference is found between "public patients" operated in a hospital in the public hospital category, and private hospitals, respectively, as between publicly and privately financed patients at the private hospitals. However, the differences in patient characteristics are smaller between the "public patient groups" than between the privately financed and publicly financed patient groups, particularly for duration of leg pain, which is the same length in both "public patient groups." Nevertheless, the final outcome is better in the public group that undergoes surgery in private clinics. This suggests that circumstances other than those considered above must serve as an explanation for the differences. One circumstance that we described in both the 2005 and 2008 reports, is that departments with many disc herniation surgeries have better outcomes than departments with few disc herniation surgeries. The four private clinics are among those that carry out the most disc herniation surgeries, which is probably a partial explanation for the better outcomes at private clinics. However, it is important to emphasize that the difference in improvement does not differ between the hospitals, with the possible exception of those departments that operate very few patients.

Significance of surgical volume for disc herniation surgery results

In earlier reports (2005 and 2008) we noted differences in outcomes between departments that carry out many versus few disc herniation surgeries. Departments that carried out fewer than 20 disc herniation surgeries/year had significantly worse results, and we urged them to consider referring their patients to departments with larger surgery volumes. It is therefore important now to determine

whether this has resulted in centralization of lumbar disc herniation surgeries. We examined surgical volume by department from 2006 to 2008. We found that four departments no longer carry out disc herniation surgery, but twelve departments still perform fewer than 20 disc herniation surgeries annually. As shown in Figures 38a and b, and Figures 39a and b, respectively, the trend toward worse outcomes continues, both in terms of leg pain and quality of life, for those departments that perform few disc herniation surgeries.

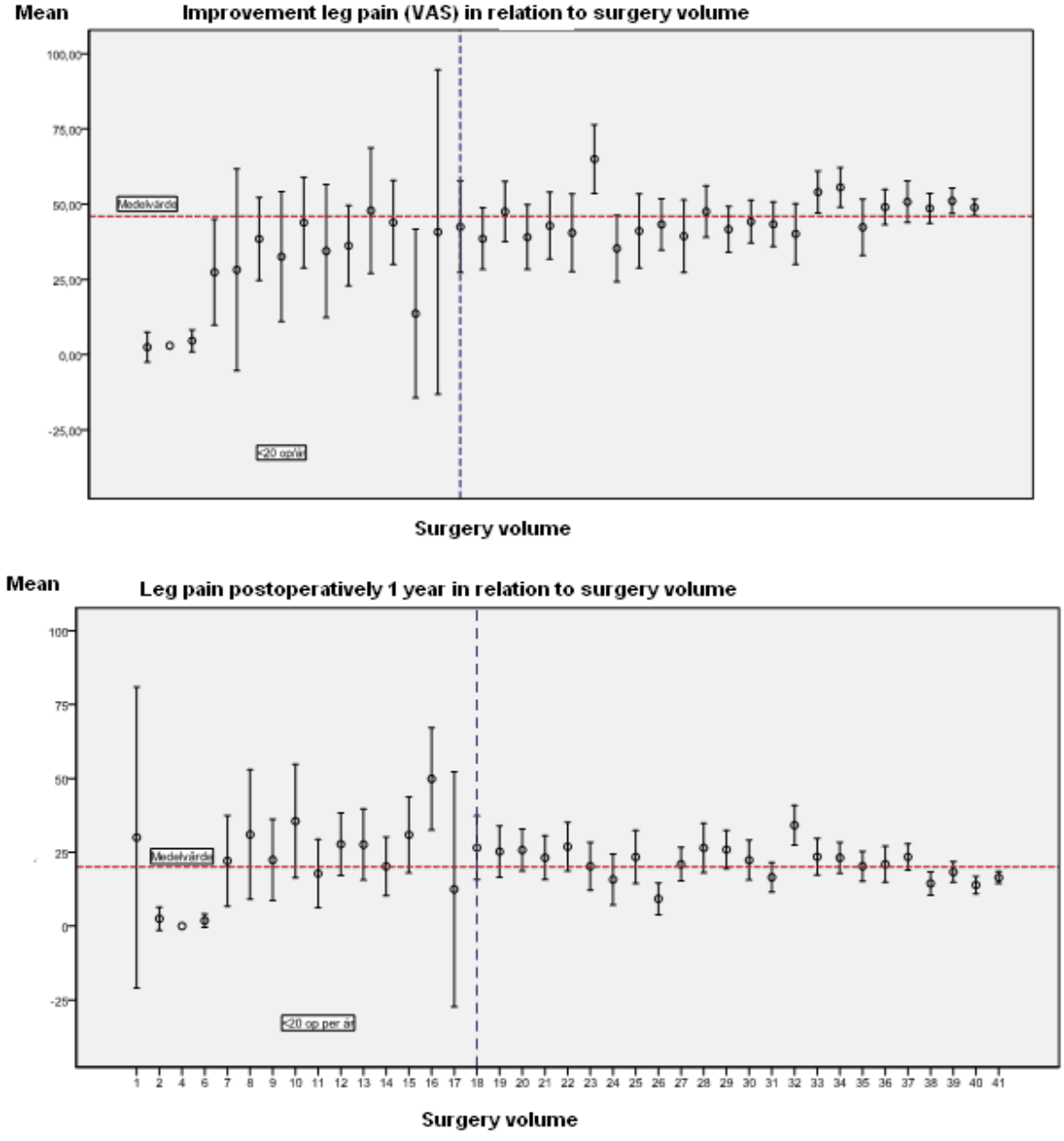


Fig. 38a and 38b. Improvement (a) and intensity (b) of leg pain after 1 year. Departments with <20 surgeries/year are to the left of the broken vertical line. The departments are sorted with increasing surgical volume to the right.

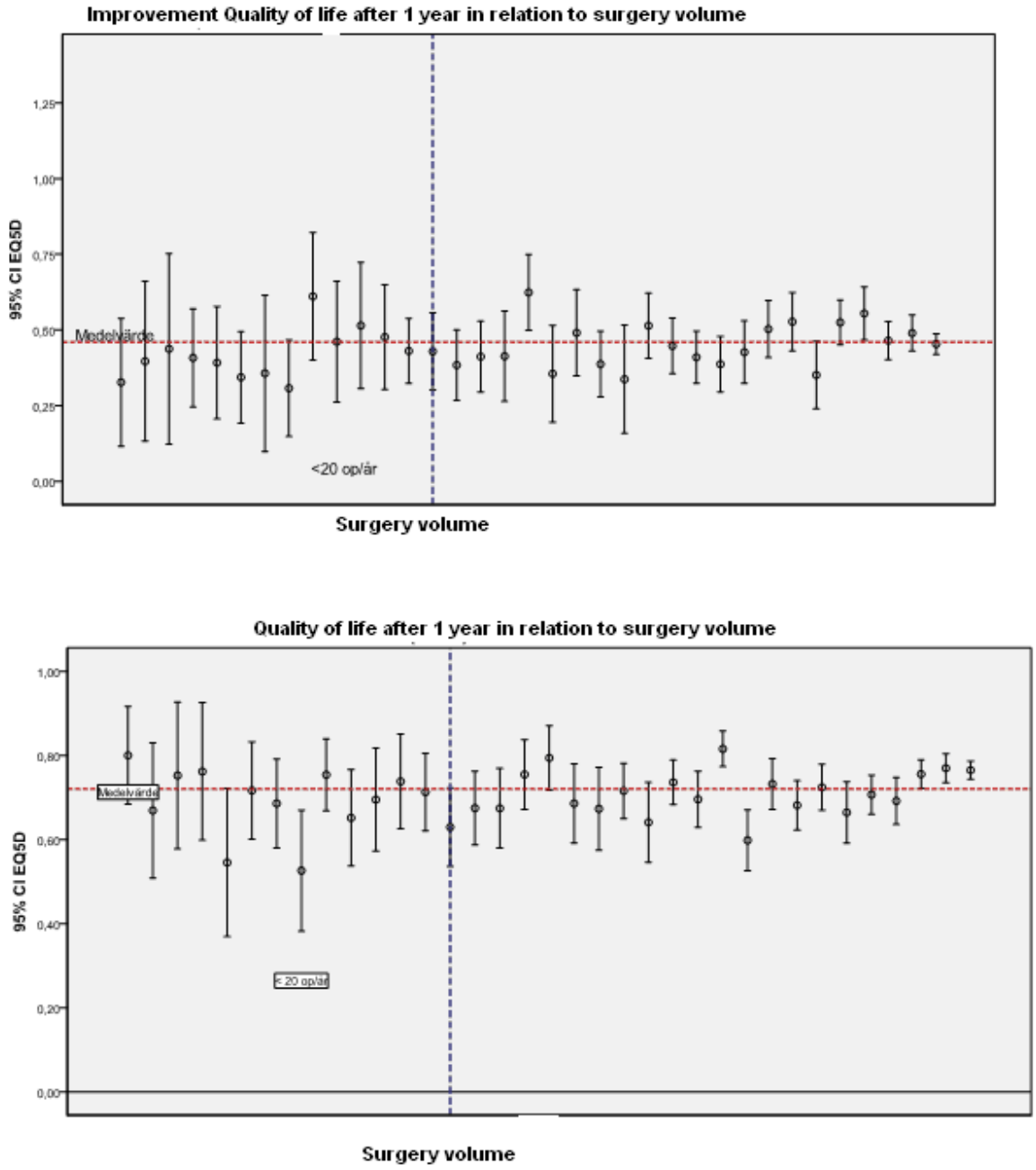


Fig 39a and 39b. Improvement (a) and level (b) in quality of life after 1 year. Departments with <20 surgeries/year are to the left of the broken vertical line. The departments are sorted with increasing surgical volume to the right.

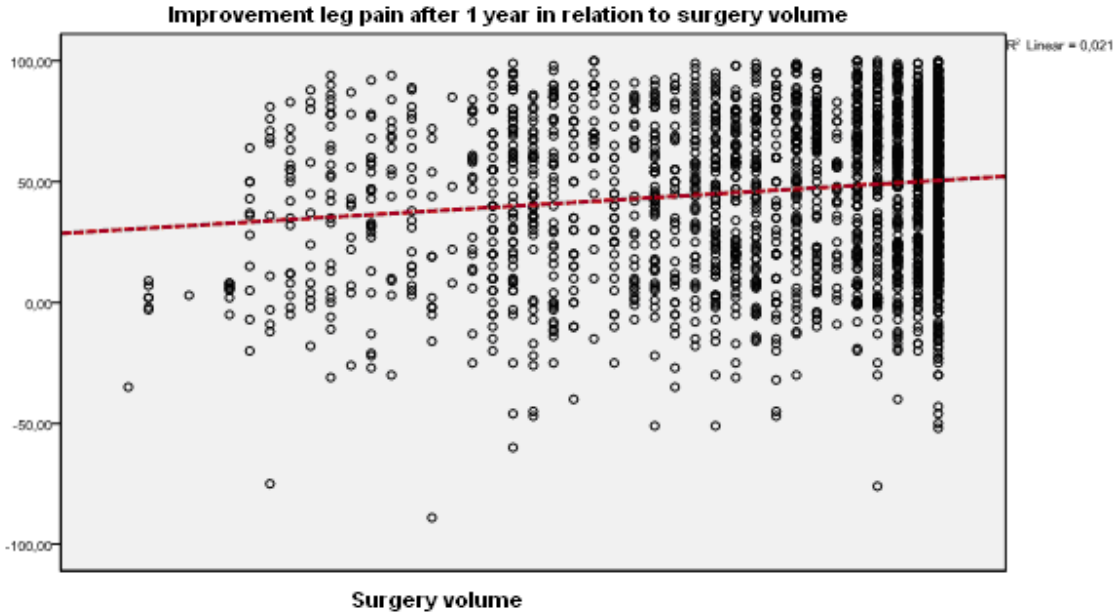
Outcomes measured by both perceived back pain and perceived leg pain at 1-year follow-up show significantly worse outcomes for departments with few operations. Even measured by the VAS for leg pain and EQ-5D for quality of life, departments with few procedures have worse outcomes (table 41).

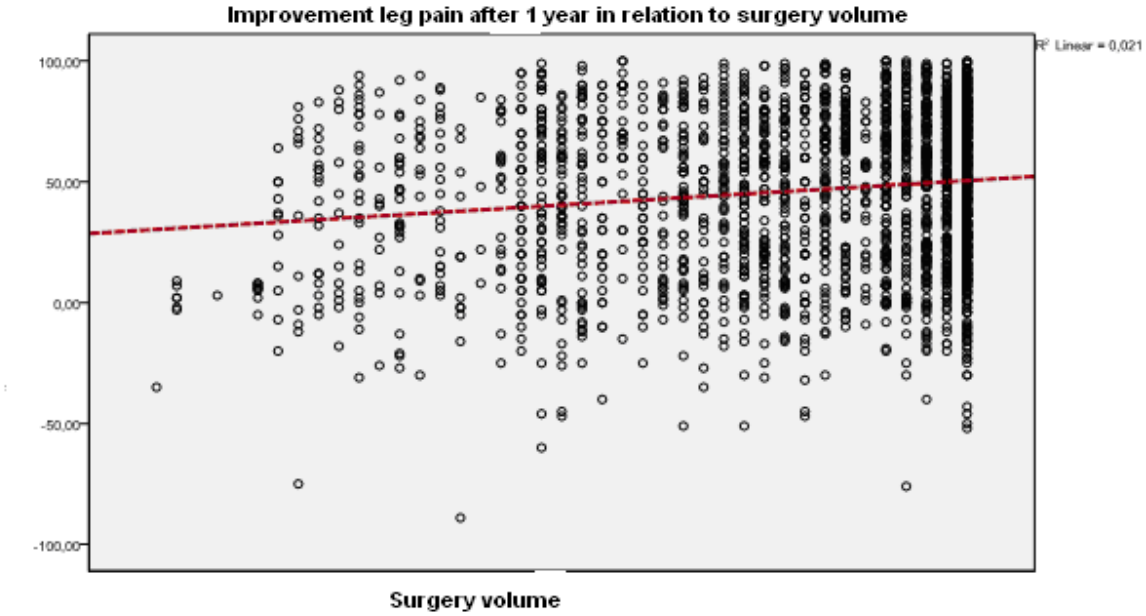
Table 41. Outcome after 1 year in relation to surgical volume.

	<20 op/year	>=20 op/year	Chi2-test
Pain-free or much better			
Back pain	68	74	0.001
Leg pain	69	76	0.0001
Satisfaction	74	77	ns
			T-test
Improvement quality of life	0.42	0.46	ns
Improvement quality of life	42	46	0.01
Quality of life (EQ-5D)	0.66	0.71	0.0001
Leg pain (VAS)	27	21	0.0001

In summary, no major change in referral patterns of disc herniation patients has occurred, but many departments still do fewer than 20 surgeries per year.

Figures 40a and b also show that a correlation still exists between high surgery volume and better outcomes, relating to both leg pain and quality of life at 1-year follow-up.





Figures 40a and 40b. Improvement of leg pain (a) and improvement in quality of life (b) after 1 year. The departments are sorted with increasing surgical volume to the right.

In summary, the situation and the problem of clinics that perform fewer operations than required to achieve optimal surgical results remains unchanged.

Discussion

Earlier reports have shown that the outcome of disc herniation surgery has been better at private spine clinics than in public hospitals, while the improvement rate has been about equal. We have not been able to analyze the reasons for this but have been able to identify differences in patient profile. The incidence of patients with privately and health insurance financed treatment has been suspected to be a reason for the better outcomes. In 2008 we introduced a variable in the register that describes type of financing (public or private/insurance company), so we now have a basis to further analyze the situation.

Our data suggest that private patients at the private spine clinics, partly because of a better starting point, achieve better outcomes. The principal reason for this appears to be that duration of pain prior to surgery was significantly shorter for the private group. However, we also find a difference between "public patients" operated for disc herniation in private hospitals, and those "public patients" operated for disc herniation in public hospitals. Even though there is no difference in duration of pain, outcomes for the public group in private hospitals are better with regard to the final outcome. One probable factor of importance is the higher average surgery volume at private clinics have than at public orthopedics departments. There may be other causal factors as well, but these can not be evaluated with the spine register's data. However, it is important to note that there also appear to be differences among the three types of public hospitals, where the university departments possibly operate on a patient group with a lower "case mix," which could drag down the results here. This remains to be analyzed in detail in future reports.

This year's analysis thus confirms two points that we have previously reported:

1. **Specialization that provides larger surgery volumes improves disc herniation surgery outcomes.**
2. **Shortening the waiting time to see a specialist and schedule surgery (which means shortening of duration of pain) improves the outcome of disc herniation surgery.**

It is essential to consider these facts from both a clinical and health policy perspective.

VI. Number of registered operations and follow-up rate

The number of patients registered for surgery for lumbar degenerative disorders has steadily increased in recent years and is illustrated in Figure 41.

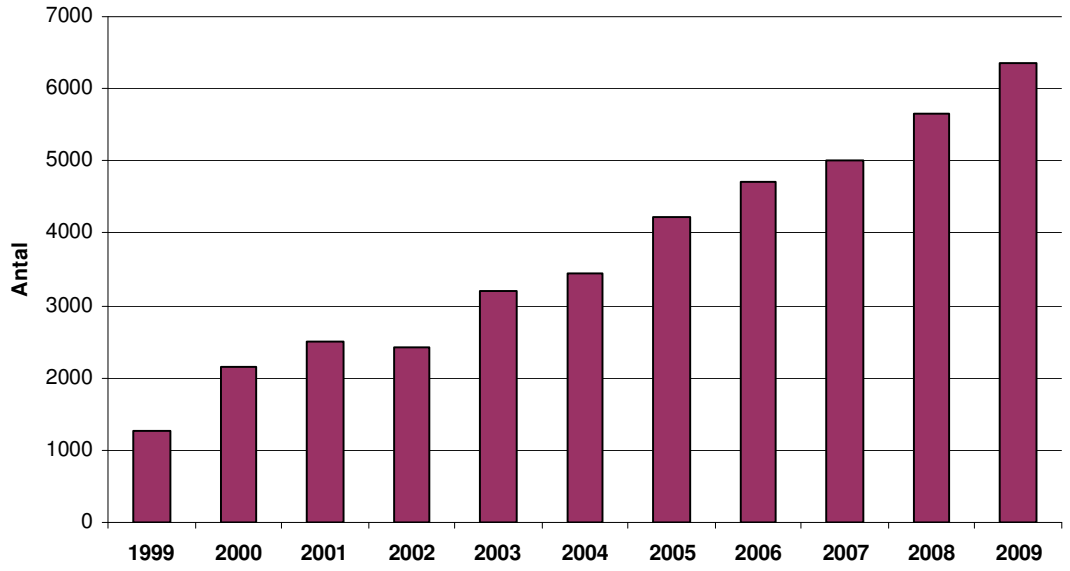


Fig 41. Number of patients registered for lumbar spine degenerative disorders 1999-2009.

Figure 42 below shows the follow-up rate at 1 and 2 years for patients operated in 2007.

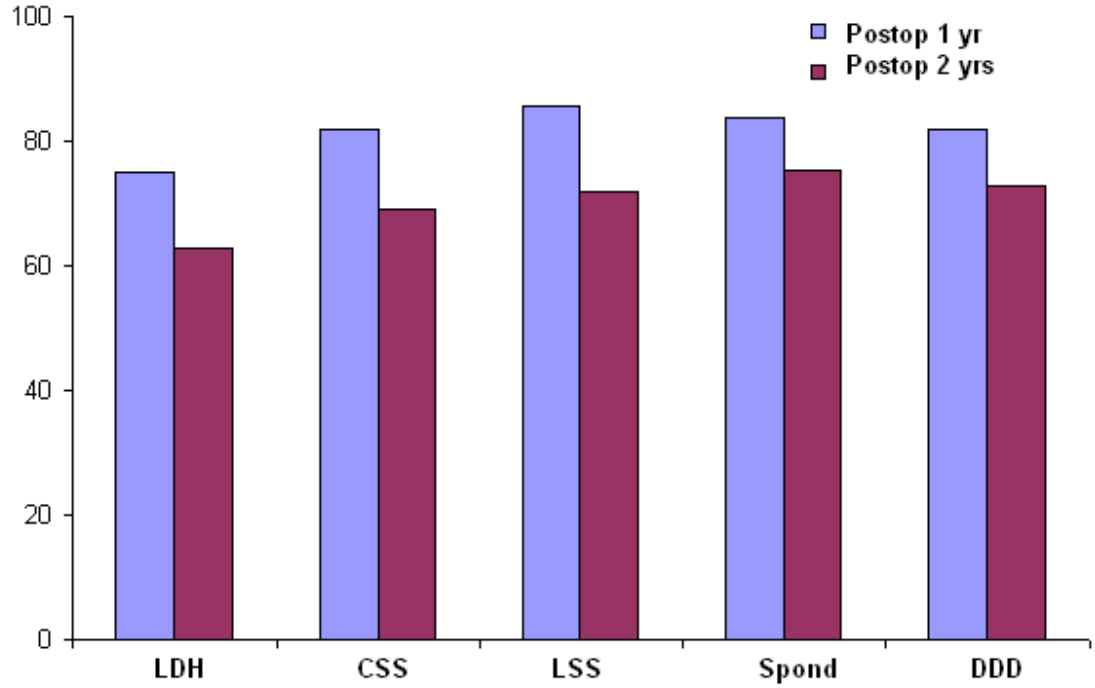


Fig 42. Current follow-up rate.

VII. Conclusion

SWESPINE, the Swedish spine register, now contains documentation of more than 50,000 lumbar spine procedures and a growing number of procedures relating to cervical spine problems, deformities, fractures, metastases and infections.

Examples of the opportunities for retrieving valuable data from the register can be seen in the list of publications, but the register also offers a basis for many more studies. It is our hope that ongoing discussions regarding the medico-legal aspects of the analysis of data from quality registers should not impede this development.

Private clinics account for a growing proportion of elective spine surgery in Sweden today and it is of great interest to examine the patient flow to these facilities and compare outcomes with the rest of the country, which is the reason for this year's in-depth analysis on the previous pages.

Once again, the register group would like to thank all of the secretaries and doctors and other people engaged in the data collection process. We also appreciate the continued financial support from SALAR that makes it possible to continue to operate and expand the register.