



Swespine 25 years
2018 ANNUAL REPORT
FOLLOW UP OF
SPINE SURGERY
PERFORMED IN SWEDEN
IN 2017

SWEDISH SOCIETY OF SPINAL SURGEONS

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Introduction

This is the 19th annual report from Swespine, the National Quality Registry for Spine Surgery, which is celebrating its 25th anniversary in 2018. Once again, the number of procedures entered in the registry increased compared with the previous year, a continuing positive trend that should please both Swedish spine surgeons and patients. Procedures related to degenerative lumbar spine disease are the most common indication in the registry, as is also true in clinical practice. Spine fractures have been entered in the Fracture Registry since 2016 and the results of surgical treatment of vertebral fractures can be tracked there.

Steering committee

Over the past year the steering committee has focused on the following areas (see details below): validation of online entry of patient information into the registry vs. the registry office from various perspectives, expansion of the steering committee to include representatives from primary care, linking up to SALAR's "Healthcare in Numbers" platform, implementing a Dialogue Support tool in the patient conference, and promoting the registry as an aid to the clinical departments regarding research, development and quality assurance. A module is now available that allows patients to directly enter their follow-up data online.

Considerable effort has also been dedicated to adjusting to reduced financial means for the registry in general, at the same time that we must guard against the loss of completeness or follow-up, both of which are exceptionally high from an international perspective concerning our diagnosis groups.

Completeness

"Coverage" is currently 98% for Swespine (49/50 clinical departments), and the percentage of index operations that are also entered in the registry, "completeness," is around 75%-80% on a nationwide basis (30%-100%). The steering committee aims to further improve completeness to 90%, and follow-up, currently about 75% after one year, to >80%.

Benchmarking using Healthcare in Numbers – comparisons between surgical departments

The public has had access to case-mix adjusted, and therefore more accurate, patient-reported results since April 2018 through the statistics database, **Healthcare in Numbers**, an open platform maintained by the Swedish Association of Local Authorities and Regions (SALAR). Both the public and individual departments have the unique opportunity to compare the outcomes from all of the departments with one another. It has taken us two years of hard work, especially with the complicated legal issues involved (see last year's Annual Report for details).

Discussion Support – Decision-making support

After years of preparations, in the fall of 2017 the steering committee, aided by statisticians and health economists, launched the "Dialogue Support" decision-making tool to assist patients and providers when discussing surgical treatment options. They can consider how the patient's profile affects his/her potential for obtaining a good postoperative outcome. The dialogue support system has proven to be a unique tool that prepares both patients and surgeons regarding expectations prior to the procedure, which is very important.

Improvement initiatives – overview – adaptation

Over the past few years the steering committee has been, and continues to be, closely engaged in addressing the various overview initiatives from central authorities, while monitoring data

capture efforts to ensure they are maintained and ultimately improved. Meanwhile, use of registry data on all levels must be initiated and supported.

After the registrar and others in the steering committee personally visited most of Sweden's spine surgery departments in 2016, they formulated a "wish list" from the clinics. This list will serve as the basis for designing standard reports to enable the departments to easily retrieve the desired statistics regarding their services. The project has been in the planning stage for a long time in part because of work related to SALAR, registry centers and other central organizations, all of which have required significant time and energy over the past few years.

The National Board of Health and Welfare and SALAR have also implemented major reorganizations, including administrative oversight and governance with accompanying adaptation requirements from the registries. The steering committee is tasked with being even more proactive to encourage services/departments to use the registries in their research and quality assurance/improvement efforts. As we see it, these efforts must be conducted in close cooperation with the surgical services and the central administration should clearly mandate such participation. Our task as registry/steering committee is to promote such development by providing appropriate opportunities. To some extent we can do so already now through the three online tools: Basic Statistics (in which all departments can view their own services in realtime, regarding both procedures and postoperative outcomes), Dialogue Support and Healthcare in Numbers (see above). Continued development of these functions is needed, tailored to user requests.

Continued efforts are being made to adapt the registry for entry and follow-up of back patients treated with non-surgical methods and some modifications to the registry have been implemented, such as outcome measures that can be used in this context. We also cooperate with other registries, such as the Hip Registry and the Fracture Registry.

As previously, the steering committee's work has included meetings with SALAR, RCO, our programmers, health economists, statisticians and attorneys, as well as with our users: spine surgeons and clinical departments. Ongoing data capture efforts remain on a par with previous years, but on the whole, registry work continues to require more administrative time than in years past, which poses a long-term threat to the service. As much time as possible should be made available for brainstorming and proactive registry work with respect to clinical departments and researchers.

Research

Scientific production of studies fully or partially based on Swespine continues to be good within Sweden, and about 20 articles were published or accepted for publication in international peer-reviewed periodicals in 2017-2018 (see VIII ref 97-114 pages 49-50). Several studies using registry data are also currently underway. As in previous years, material based on registry data has been presented at about twenty national and international spine conferences (see IX page 51).

Outcomes: men and women

Several registry studies have been published comparing spine surgery outcomes between men and women (ref 77, 81, 102 pages 47-49). One of these studies (81) shows that the final outcome after disc herniation surgery is somewhat worse for women than for men, and the explanation given is that the women reported that they felt somewhat worse at the time of surgery. A registry study from 2017 finds no difference between the genders regarding final

outcome after surgery for chronic lumbar back pain. Healthcare in Numbers offers the option of displaying the outcomes for both men and women. Dialogue Support (see above) also shows whether gender differences have predictive value. In general, it can be said that such differences are small.

NQRA – National Quality Registries Association

This association, with representatives from the national quality registries, focused on consolidation over the past year. The task of the NQRA is to monitor the opportunities and working conditions of the registries in every possible way, as well as to have representatives in various decision-making organizations, including those that decide on allocation of funds (see the following link to an opinion column published on Sept. 4, 2018:

<https://www.svd.se/fel-att-kapa-anlagen-till-vardens-kvalitetsregister>).

NPA – national program area for diseases of the musculoskeletal system.

This organization, which for us is headquartered in Region Västra Götaland (RVG), was formed during the year as one of 18 program areas:

<https://skl.se/halsasjukvard/kunskapsstodvardochbehandling/systemforkunskapsstyrning/nationellaprogramomraden.1814.html>

The task of the NPA is to “lead knowledge management” within its respective areas of responsibility. Spine surgery has been incorporated into this area under the subdivision of orthopedics, which is perhaps unfortunate since our services are provided on the same terms as those of neurosurgeons. The steering committee has therefore recommended that spine surgery should have its own subdivision within the NPA for diseases of the musculoskeletal system. Classification within a subdivision of our own would probably help us to achieve our objective of improving data entry and follow-up at the neurosurgery departments.

International

Efforts to make relevant international comparisons of registry-based outcomes in lumbar spine surgery continue, and one article has been published comparing case-mix adjusted outcomes after surgery for lumbar spinal stenosis in Sweden, Norway and Denmark, while another making the same comparison regarding lumbar disc herniation has been accepted and a third article comparing outcomes after surgery for chronic back pain is in the pipeline. A fourth study comparing randomized clinical trial (RCT) outcomes with national registry outcomes is underway. Should this last study show equivalent results, it may have great significance for future research since we could avoid carrying out prolonged and expensive clinical trials and instead rely on well-designed registry studies. The literature already has several studies which indicate that this is indeed a possibility, such as **Benson K, Hartz AJ.** A comparison of observational studies and randomized controlled trials. *N Engl J. Med.* 2000

Finances

An ongoing problem is the reduction of national grants to all quality registries. Over the course of 2017 and 2018, the grants to Swespine have declined by about 40%. In December an expert group and the steering committee of the newly formed national program area for musculoskeletal diseases (see above) will determine how the situation will be for Swespine in 2019.

In 2017 the financial deficit for the registry was SEK 973,000 and in 2018 the deficit is preliminarily estimated at SEK 1.3 million. We have handled the situation using funds that we “saved” in the past, including inexpensive server and programming costs. The remaining funds have been set aside for continued development to ensure opportunities to implement

planned improvements, such as standard reports and webinars. It is not yet clear at the time of writing whether we will have to deal with yet another funding cut in 2019.

New working methods

In order to take a creative approach to support improvement initiatives, in 2019 we plan to launch webinars to provide support for the clinical departments. Along with the standard reports mentioned above, these efforts should provide a powerful incentive to use registry data in daily clinical practice.

Following a careful inventory conducted by the registry office, we observed that the follow-up rate is somewhat higher when the office takes care of it, which also substantially relieves the workload of the departments, free of charge.

Possibly the six Regional Registry Centers (Swespine is affiliated with the RRC in Linköping), will become more active participants in the distribution of funding in the future. Increasingly intensive discussions are also underway regarding standardization of registry data collection (National Programme for Data Collection, NPDC), storage/processing and reporting, and the use of “National Interdisciplinary Terminology” (<https://www.socialstyrelsen.se/publikationer2011/2011-3-29>).

If these initiatives are implemented, many of the national quality registries will face major challenges that will affect medical recordkeeping and uploading data from patient chart to registry or the reverse.

Certification level 1

For the past two years SALAR’s registry expert group has rated Swespine as one of a small number of registries (13/108) at Certification Level 1, the highest possible level of quality. This gives high reliability and may provide some long-term benefits, such as in relation to allocation of funds. We can be proud of this achievement and will do what is necessary to maintain Level 1 status. This year SALAR presented specific requirements that a registry must meet to be classified in one of the four levels: Candidate Level – Level 3 – Level 2 – Level 1. SALA presented these requirements in its Q4 Interim Report and we have two years in which to remedy any requirements that the registry does not meet. The steering committee is carrying out an inventory of the area and will take any measures that may be necessary.

This Annual Report serves as documentation for the comprehensive systematic compilation of spine surgery procedures carried out in our country through the Swespine project, and the steering committee would like to thank all of the surgeons, clinical directors, secretaries and other dedicated occupational groups for their outstanding efforts. In an international context, the work with the Swespine national registry is unique, and the software for Swespine has also been purchased by several countries, which facilitates international collaboration (see International above).

September 10, 2018

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I. Lumbar spine procedures in Sweden 2017

A total of 9,484 patients who had lumbar spine surgery at a total of 50 departments were entered in the registry in 2017. In 2016, 8,869 patients from 46 departments were entered in the registry.

Breakdown by diagnosis for patients operated in 2017: Disc herniation 25%, Disc herniation, cauda (cauda equina syndrome) 1%, disc herniation foraminal/extraforaminal 1%, central spinal stenosis (CSS) 48%, lateral/foraminal spinal stenosis (LSS) 11%, spondylolisthesis 4%, segmental pain/DDD (SP/degenerative disc disorder) 7%, coccygodynia 0.4%, back pain after decompression 0.2% and other 4%, Figure 1.

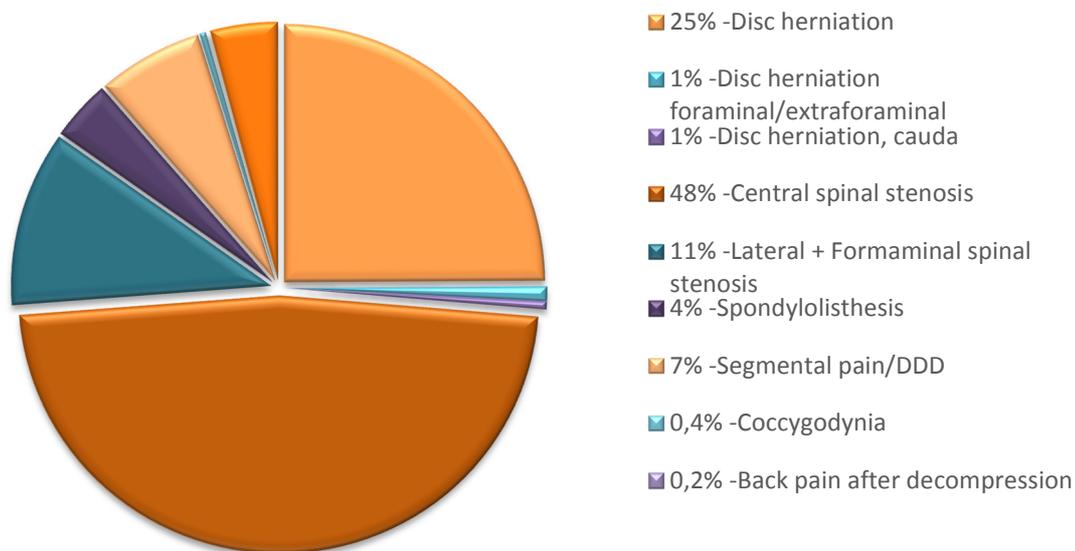


Fig. 1. Breakdown by diagnosis: Lumbar spine surgery Total number of patients who had lumbar spine surgery entered in the registry in 2017: 9,484 patients.

Lumbar disc herniation (LDH)

Demographic data paramedian and central disc herniation combined

In 2017, 2,355 paramedian and central disc herniation surgeries were entered in the registry. The patients included 56% men and 44% women. The proportion of smokers was 9.7%. Mean age was 45 (14–92) years and figure 2 shows the age distribution.

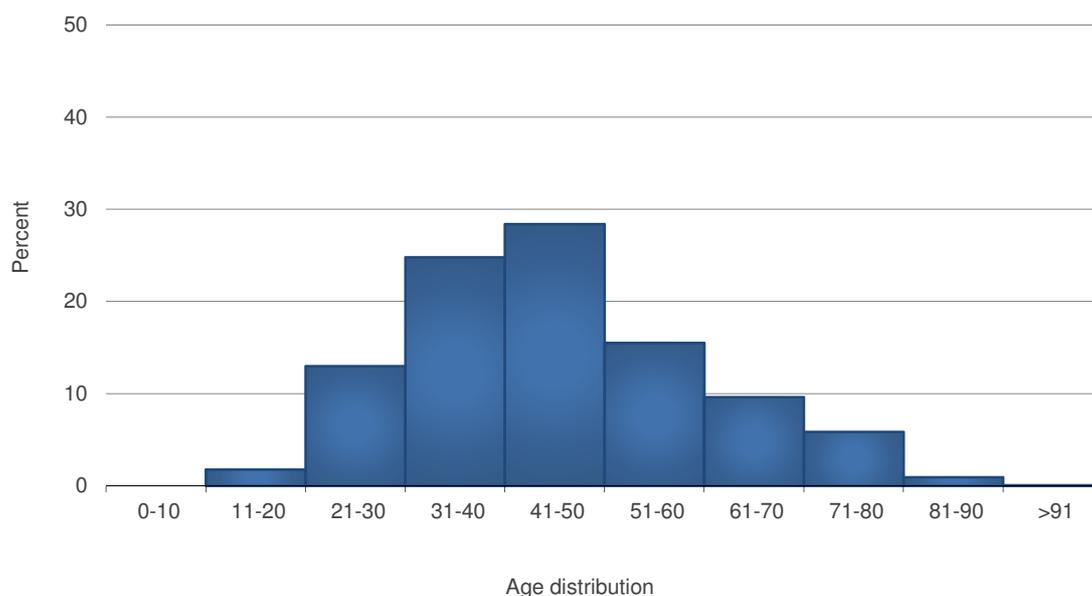


Fig. 2. Age distribution, disc herniation, n = 2,262.

This disc herniation operation was the first lumbar spine surgery for 87% of patients, while 13% had been previously operated.

Preoperative duration of back pain: 5% had no back pain, 10% had a history of back pain for less than 3 months, 49% 3-12 months, 14% 1-2 years and 22% more than 2 years.

Preoperative duration of leg pain/sciatica: 1% of patients had no leg pain, 14% had leg pain for less than 3 months, 57% for 3-12 months, 14% for 1-2 years and 14% had pain for more than 2 years.

Patient-reported mean back pain on the NRS was 5.3 on a scale of 0–10, while mean leg pain/sciatica was 7.1 on the same scale of 0–10. Distribution regarding both back and leg pain can be seen in figures 3 and 4.

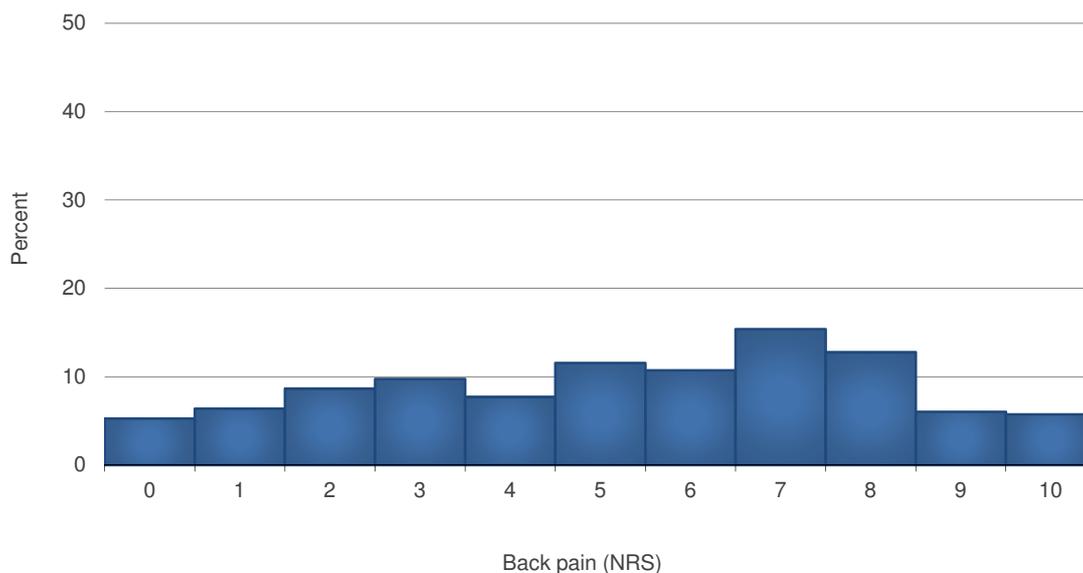


Fig. 3. Back pain on the Numeric Rating Scale (NRS) preoperatively in patients with disc herniation (%).

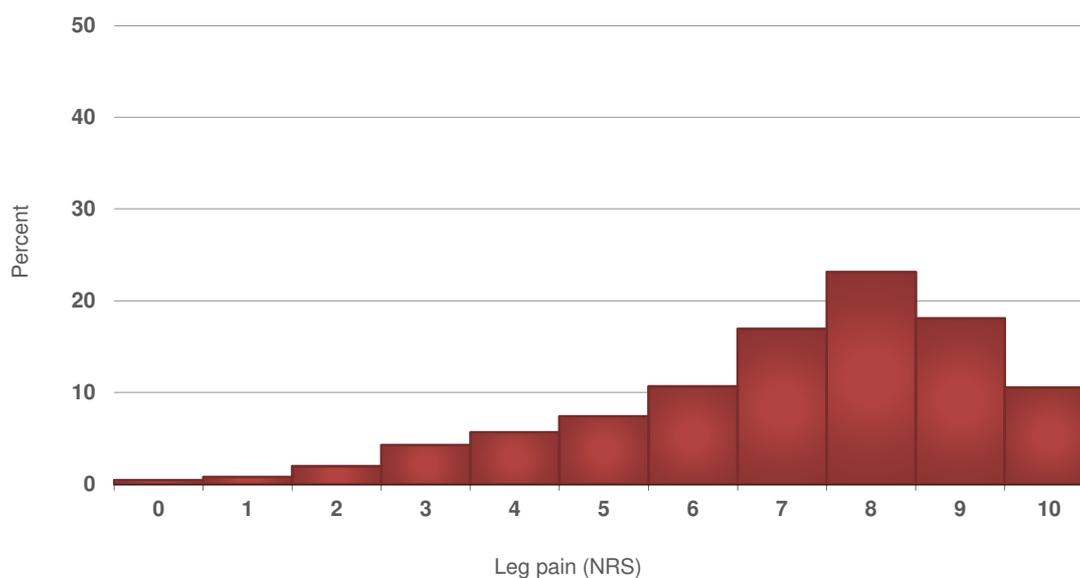


Fig. 4. Leg pain on the Numeric Rating Scale preoperatively in patients with disc herniation (%).

Regular analgesic use was reported by 64% of patients, intermittent use by 25%, while 11% reported that they did not take any form of analgesics.

Walking distance was estimated at less than 100 m by 28% of patients, 100–500 m by 21% of patients, 500 m–1 km for 16% of patients and more than 1 km by 35% of patients.

Surgical data paramedian and central disc herniation combined

Conventional disc surgery was carried out in 50% of cases and microscopic disc surgery in 38%. 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 date of surgery through discharge, was 1.06 (0-30).

Demographic data foraminal disc herniation

In 2017, 83 foraminal disc herniation surgeries were entered in the registry. The patients included 55% men and 45% women. The proportion of smokers was 3%. Mean age was 58 (30–83) years.

This disc herniation operation was the first lumbar spine surgery for 81% of patients.

Preoperative duration of back pain: 5% had no back pain, 17% had a history of back pain for less than 3 months, 34% 3-12 months, 22% 1-2 years and 22% more than 2 years.

Preoperative duration of leg pain/sciatica: 3% of patients had no leg pain, 19% had leg pain for less than 3 months, 33% for 3-12 months, 26% for 1-2 years and 19% had pain for more than 2 years.

Patient-reported mean back pain on the NRS was 5.3 on a scale of 0–10, while mean leg pain/sciatica was 6.6 on the same scale of 0–10.

Surgical data foraminal disc herniation

Conventional disc surgery was carried out in 36% of cases and microscopic disc surgery in 29%. 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 date of surgery through discharge, was 1.63 (0-9).

Demographic data disc herniation with cauda equina symptoms

In 2017, 43 cauda equina disc herniation surgeries were entered in the registry. The patients included 39% men and 61% women. The proportion of smokers was 11%. Mean age was 43 (16–83) years.

This disc herniation operation was the first lumbar spine surgery for 88% of patients.

Preoperative duration of back pain: 19% had no back pain, 25% had a history of back pain for less than 3 months, 25% 3-12 months, 6% 1-2 years and 25% more than 2 years.

Preoperative duration of leg pain/sciatica: 0% of patients had no leg pain, 53% had leg pain for less than 3 months, 29% for 3-12 months, 12% for 1-2 years and 6% had pain for more than 2 years.

Patient-reported mean back pain on the NRS was 5.6 on a scale of 0–10, while mean leg pain/sciatica was 7.6 on the same scale of 0–10.

Surgical data disc herniation cauda equina symptoms

Conventional disc surgery was carried out in 52% of cases and microscopic disc surgery in 26%, as well as 12% decompression surgery – non-midline sparing.

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 date of surgery through discharge, was 2.39 (0-13).

Central spinal stenosis in lumbar spine

Demographic data

A total of 4,491 patients were entered in the registry for surgery for central spinal stenosis in 2017, including 47% men and 53% women. The proportion of smokers was 10%. Mean age was 69 (21-94) years. Figure 5 shows the age distribution.

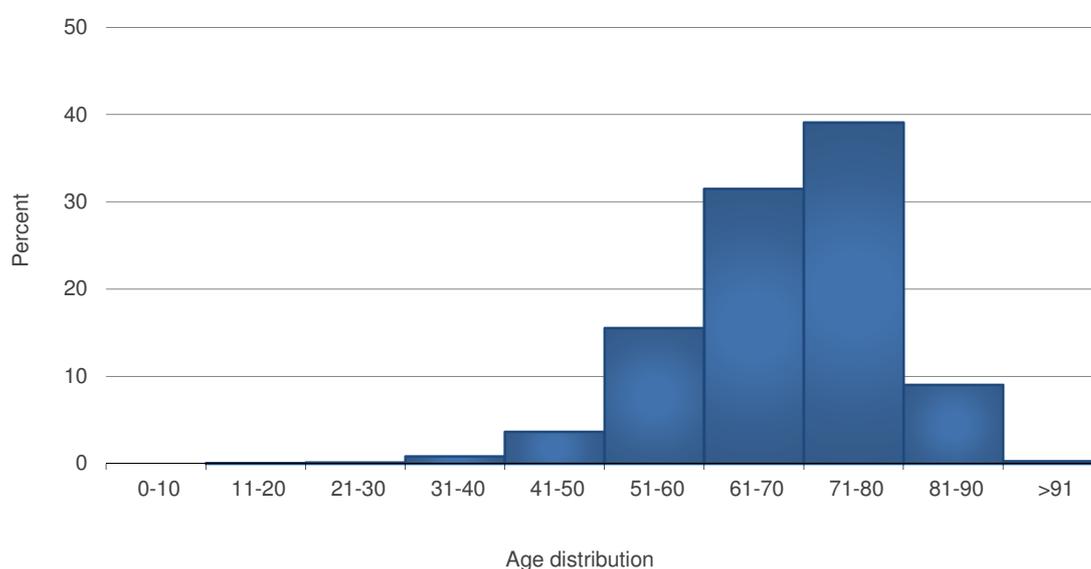


Fig. 5. Age distribution, central spinal stenosis, n = 4,491 patients.

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: 5% had no back pain, 2% had a history of back pain for less than 3 months, 19% 3-12 months, 23% 1-2 years and 51% more than 2 years.

Preoperative duration of leg pain: 4% of patients had no leg pain, 3% reported leg problems for less than 3 months, 28% 3-12 months, 27% 1-2 years and 38% reported problems for more than 2 years.

Mean NRS score reported for back pain in the group was 6.1 (0-10) and for leg pain/sciatica 6.7 (0-10). Figures 6 and 7 present the distribution of reported NRS pain scores.

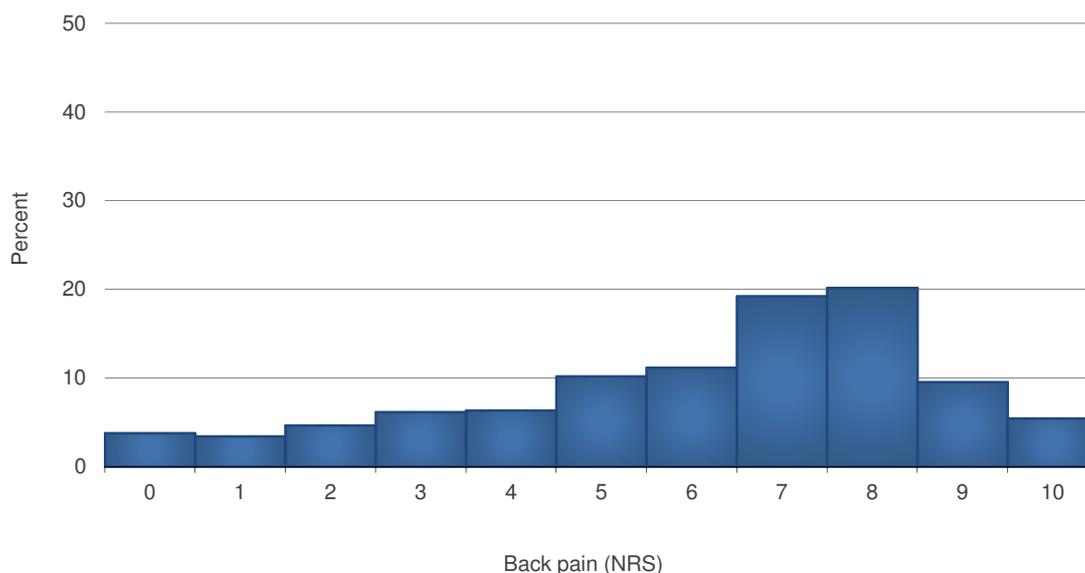


Fig. 6. Back pain on the Numeric Rating Scale preoperatively in patients with central spinal stenosis (%).

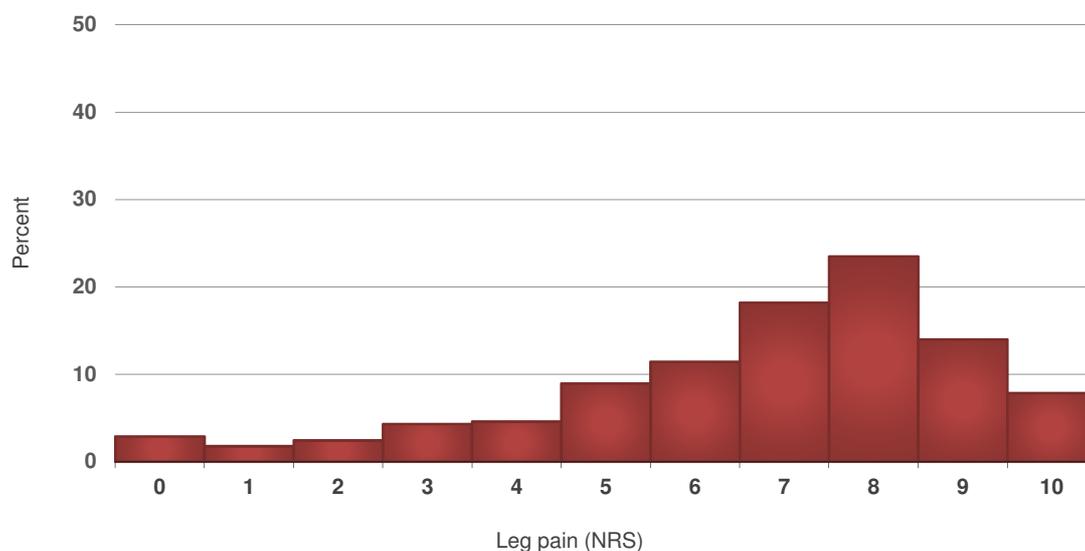


Fig. 7. Leg pain on the Numeric Rating Scale preoperatively in patients with central spinal stenosis (%).

Among patients with central spinal stenosis, 53% reported regular use of analgesics, 30% reported intermittent use and 17% reported that they did not take any analgesic medication.

Walking distance was estimated at less than 100 m by 37% of patients, 100–500 m by 31% of patients, 500 m–1 km for 15% of patients and more than 1 km by 17% of patients.

Surgical data

In 89% of cases only decompressive surgery was carried out, in 81% non-midline sparing and 8% midline sparing. Decompression combined with posterior instrumented fusion was carried out in 6% of cases, decompression + posterior non-instrumented fusion in 2%, decompression + PLIF/TLIF in 1% and other procedures in 2%.

Mean length of stay in days was 2.0 (0-29).

Lateral and foraminal spinal stenosis combined

Demographic data

In 2017, 1,040 patients were operated for lateral and foraminal spinal stenosis. The patients included 57% men and 43% women. The group included 6% smokers.

Mean age was 60 (20–92) years and figure 8 shows the age distribution.

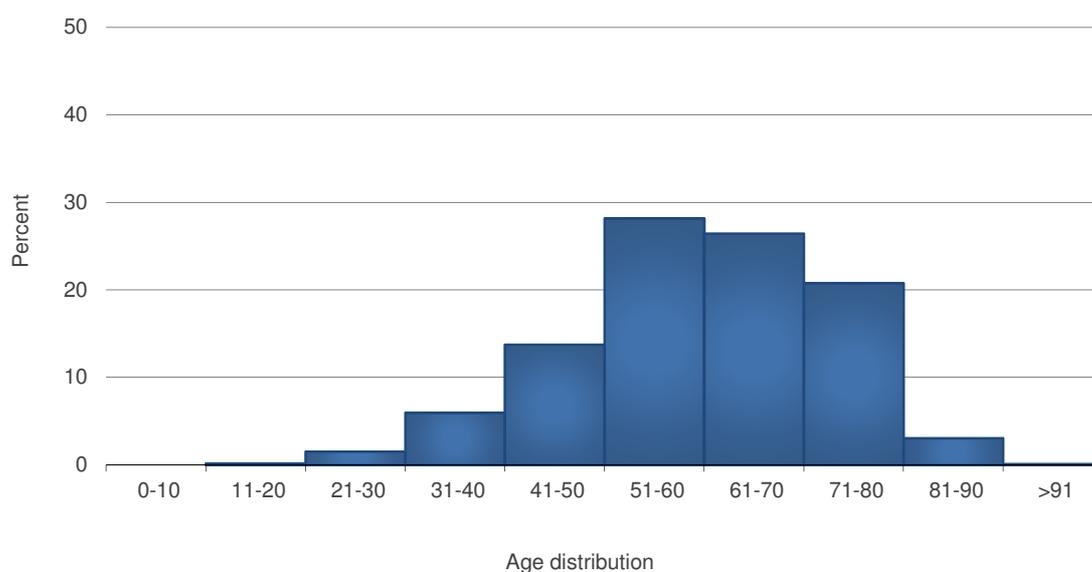


Fig. 8. Age distribution, lateral and foraminal spinal stenosis, n = 1,040.

The majority of patients with lateral and foraminal spinal stenosis, 76%, had no previous spine surgery, while 24% had been operated on one or more times before the current procedure.

Preoperative duration of back pain: 5% had no back pain, 2% had a history of back pain for less than 3 months, 22% 3-12 months, 24% 1-2 years and 47% more than 2 years.

Preoperative duration of leg pain: 2% of patients with lateral spinal stenosis had no leg pain, 2% of patients reported leg problems for less than 3 months, 30% for 3-12 months, 28% for 1-2 years and 38% reported problems for more than 2 years.

Mean NRS score reported for back pain in the group was 6.0 (0–10) and for leg pain 7.0 (0–10). Figures 9 and 10 present the distribution of reported NRS pain scores.

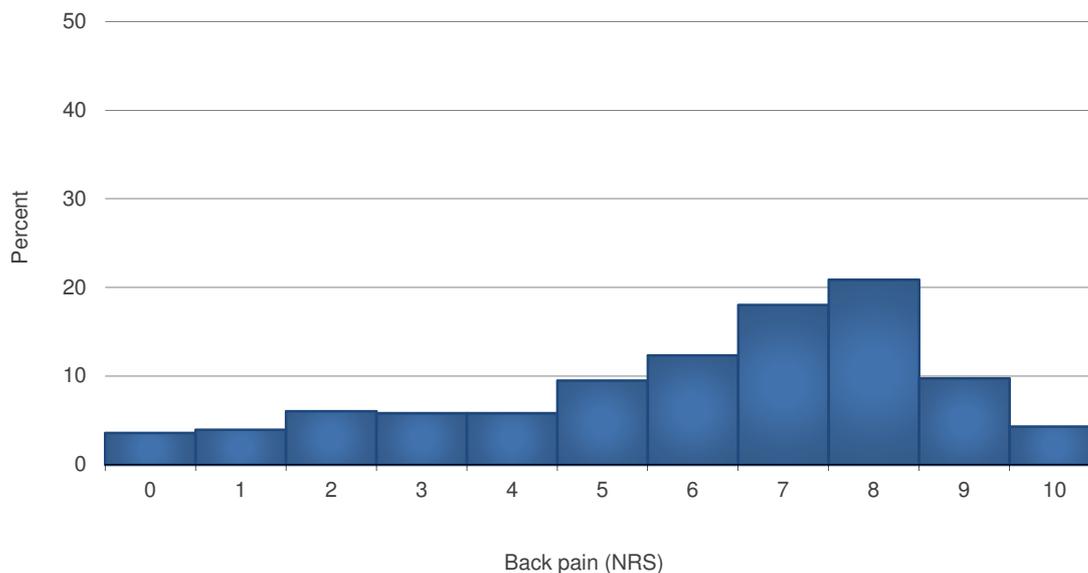


Fig. 9. Back pain on the Numeric Rating Scale preoperatively in patients with lateral/foraminal spinal stenosis (%).

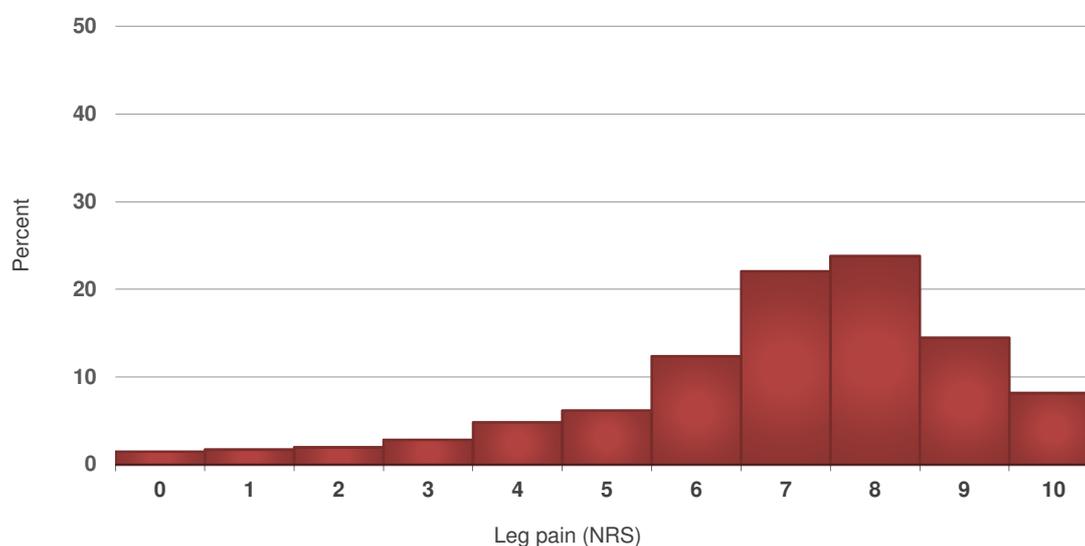


Fig. 10. Leg pain on the Numeric Rating Scale preoperatively in patients with lateral/foraminal spinal stenosis (%).

Regular analgesic use was reported by 56% of patients, intermittent use by 30%, and 14% reported they did not take any analgesics. The majority of patients reported limited walking ability, 25% reported they were able to walk less than 100 m, 30% were able to walk 100–500 m, 18% 500 m–1 km and 27% had a walking distance of more than 1 km.

Surgical data

Decompression surgery was the type of procedure in the majority of cases, 74%, including 32% non-midline sparing and 42% midline sparing, while 19% had decompression + posterior instrumented fusion, 2% decompression + PLIF/TLIF and 5% other. Mean length of stay (total) was 1.8 (0-16).

Spondylolisthesis

Demographic data

A total of 361 patients, including 52% men and 48% women, were reported for 2017. This group included 7% smokers. Mean age was 51 (17–82) years and figure 11 shows the age distribution.

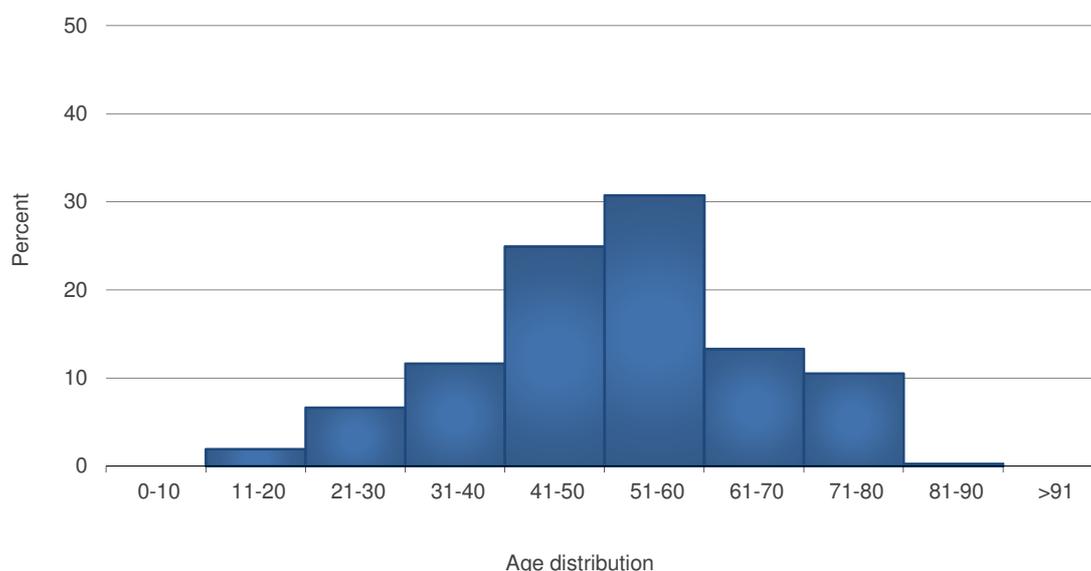


Fig. 11. Age distribution, spondylolisthesis, n = 361 patients.

For 94% 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: 3% had no back pain, 1% had a history of back pain for less than 3 months, 15% 3-12 months, 19% 1-2 years and 62% more than 2 years.

Preoperative duration of leg pain: 10% of patients with spondylolisthesis had no leg pain, 3% of patients with spondylolisthesis reported leg problems for less than 3 months, 21% 3-12 months, 25% 1-2 years and 41% reported problems for more than 2 years.

Patients reported that preoperative lumbar pain on the NRS was 6.4 (0–10) and preoperative leg pain was 5.5 (0–10). Figures 12 and 13 present the distribution of NRS scores.

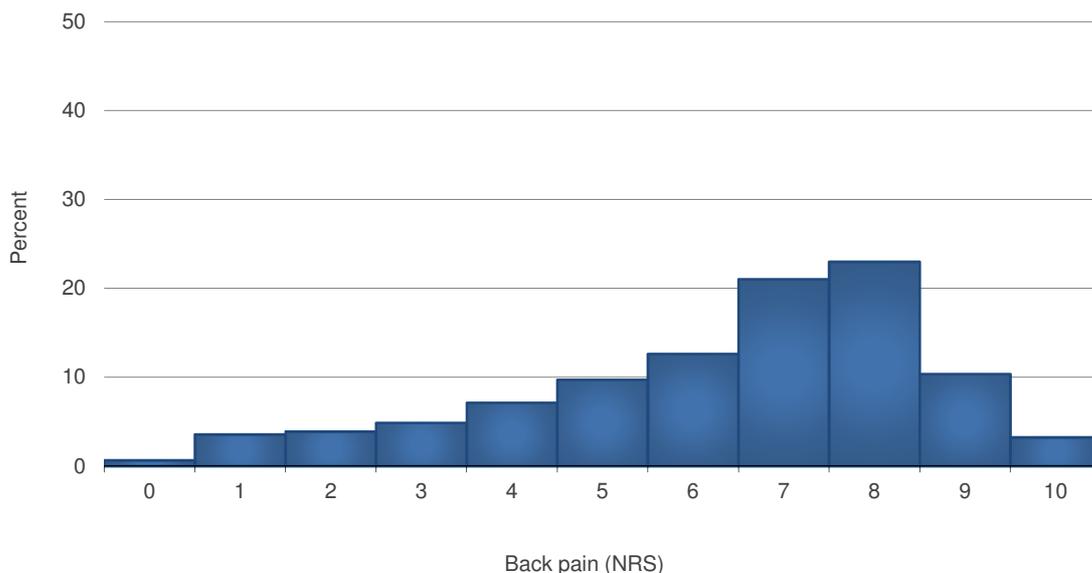


Fig. 12. Back pain on the Numeric Rating Scale preoperatively in patients with spondylolisthesis (%).

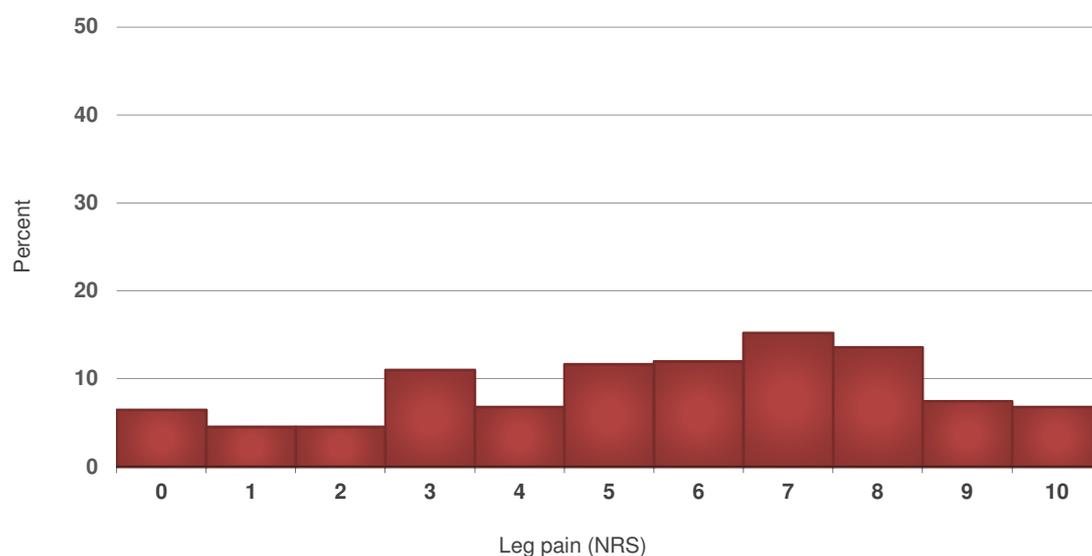


Fig. 13. Leg pain on the Numeric Rating Scale in patients with spondylolisthesis (%).

Regular analgesic use was reported by 43% of patients, intermittent use by 40% of patients while 17% did not use analgesics.

Walking distance was estimated at less than 100 m by 18% of patients, 100–500 m by 23% of patients, 500 m–1 km for 17% of patients and more than 1 km by 42% of patients.

Surgical data

Patients with spondylolisthesis had a variety of different procedures. They are presented in descending order of frequency: Decompression + instrumented fusion 53%, posterior instrumented fusion 20%, instrumented global fusion 9%, decompression + PLIF/TLIF 5%, PLIF/TLIF 2%, decompression + posterior non-instrumented fusion 5%, and other interventions in the remaining cases.

Mean length of stay in days was 3.05 (0-14).

DDD (degenerative disk disorder or Segmental pain/SP)

Demographic data

A total of 631 patients were entered in the registry for surgical intervention for DDD in 2017, including 55% men and 45% women. The proportion of smokers was 3%. Mean age was 45 (18–79) years and figure 14 shows the age distribution.

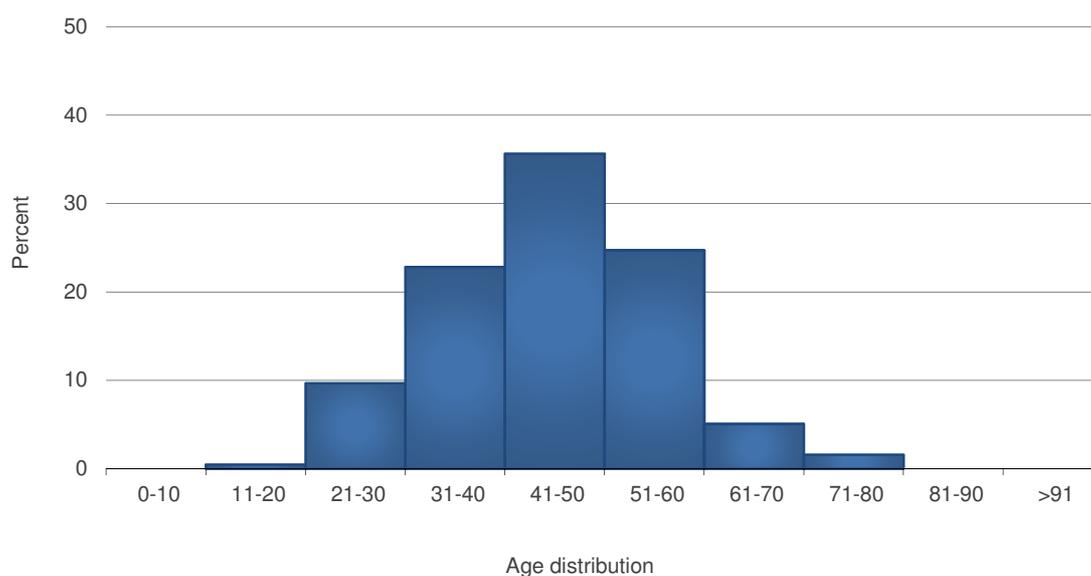


Fig. 14. Age distribution, DDD, n = 631 patients.

In this group of patients, 71% had surgery for the first time, while 29% had been operated one or more times previously.

Preoperative duration of back pain: 0.5% had no back pain, 0.5% had a history of back pain for less than 3 months, 9% 3-12 months, 16% 1-2 years and 74% more than 2 years.

Preoperative duration of leg pain: 23% of patients with DDD had no leg pain, 1% reported leg problems for less than 3 months, 14% 3-12 months, 20% 1-2 years and 42% reported problems for more than 2 years.

Estimation on the NRS for back pain showed a mean of 6.9 (0–10) and leg pain, 4.2 (0-10). Figures 15 and 16 present the distribution of NRS scores.

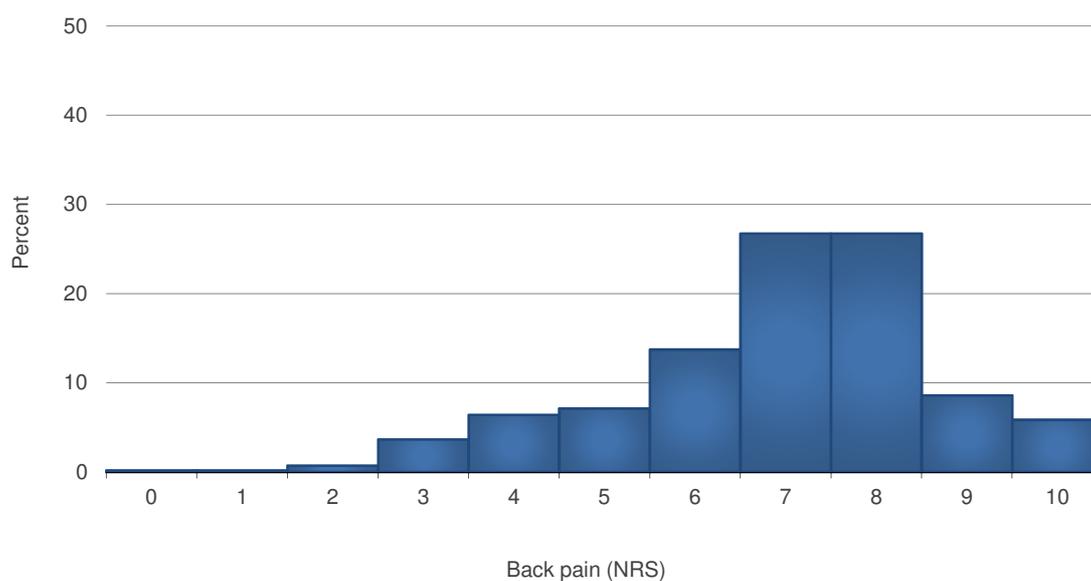


Fig. 15. Back pain on the Numeric Rating Scale preoperatively in patients with DDD (%).

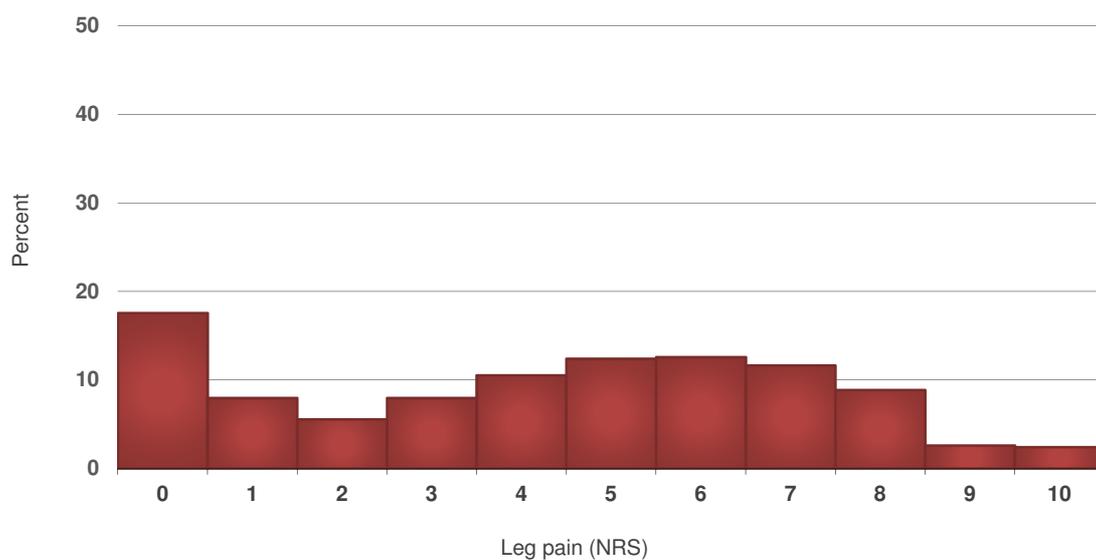


Fig. 16. Leg pain on the Numeric Rating Scale preoperatively in patients with DDD (%).

Regular analgesic consumption was reported by 58% of patients, intermittent use by 32% while 10% never took analgesics.

Walking distance was estimated at less than 100 m by 9% of patients, 100–500 m by 16% of patients, 500 m–1 km for 25% of patients and more than 1 km by 50% of patients.

Surgical data

A heterogeneous surgical treatment spectrum was also seen for this diagnosis as follows: Posterior instrumented fusion 33%, instrumented global fusion 14% (should be validated), disc replacement 14%, PLIF/TLIF 10%, decompression PLIF/TLIF 8%, decompression + posterior instrumented fusion 11% and a small number of other interventions. Mean length of stay was 3.0 (0-10) days.

Back pain after decompression

(Note: only 19 patients because the diagnosis group was implemented in 2016)

Demographic data

A total of 19 patients, including 37% men, were reported for 2017. This group included 8% smokers. Mean age was 62 years (43-81).

Preoperative duration of back pain: 0% had no back pain, 0% had a history of back pain for less than 3 months, 17% 3-12 months, 17% 1-2 years and 66% more than 2 years.

Preoperative duration of leg pain: 8% of patients with DDD had no leg pain, 0% reported leg problems for less than 3 months, 17% 3-12 months, 25% 1-2 years and 50% reported problems for more than 2 years.

Regular analgesic consumption was reported by 34% of patients, intermittent use by 58%, while 8% never took analgesics.

Walking distance was estimated at less than 100 m by 25% of patients, 100–500 m by 25% of patients, 500 m–1km for 17% of patients and more than 1 km by 33% of patients.

Surgical data

In this group, posterior instrumented fusion was carried out in 39% of cases and decompression with posterior instrumented fusion in 28%.

II. One-year follow-up in 2017 of lumbar spine procedures carried out in 2016

A total of 8,878 patients were operated in 2016 and 6,717 (76%) completed one year of follow-up. The distribution is as follows: disc herniation 2,212/1,450, central spinal stenosis 4,427/3,615, lateral spinal stenosis 888/690, spondylolisthesis 324/242 and DDD 603/444. Patients with other diagnoses, 424/275, are not reported in the following results (number of surgeries/number of patients followed up)

Lumbar disc herniation (LDH) operated in 2016 and followed up in 2017

Of 1,450 patients who were operated for lumbar disc herniation and completed 1-year follow-up, 55% were men and 45% women, with a mean age of 45 (13–90) years.

Surgical interventions: 43% conventional herniated disc surgery, 43% microscopic disc surgery, 7% decompression alone and 8% other procedures.

Mean preoperative NRS score for back pain was 5.4, compared with 2.9 postoperatively. The corresponding figures for leg pain were 7.1 preoperatively and 2.5 postoperatively. Figures 17 and 18 show preoperative and postoperative NRS for back and leg pain, respectively.

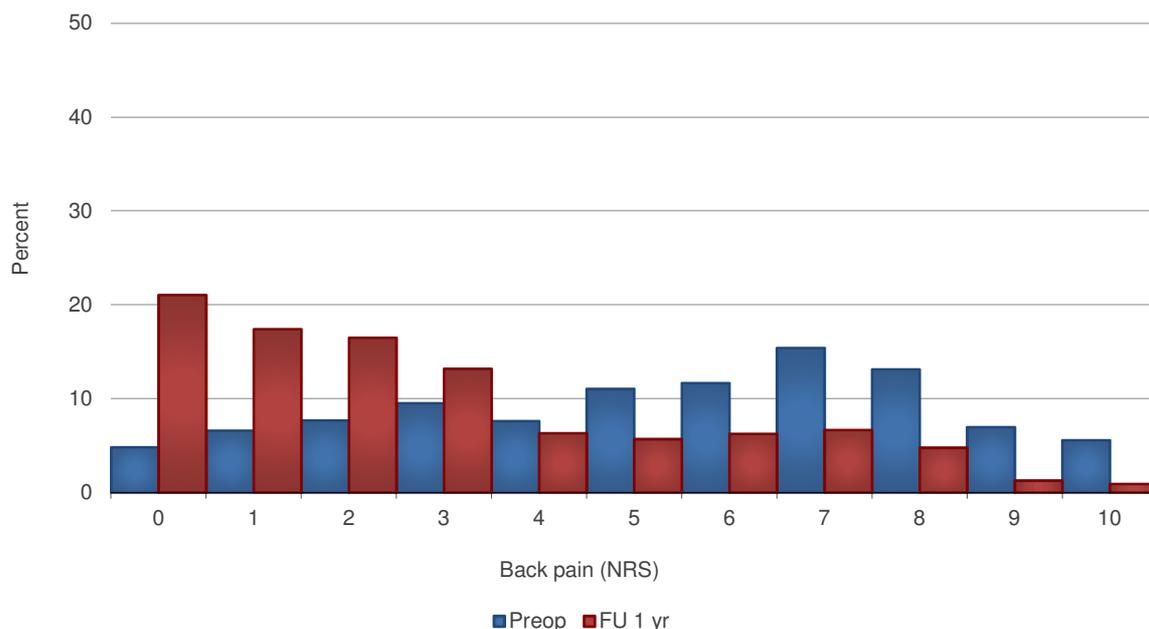


Fig. 17. Back pain on the Numeric Rating Scale preoperatively and 1 year postoperatively in patients operated for lumbar disc herniation in 2016 (%).

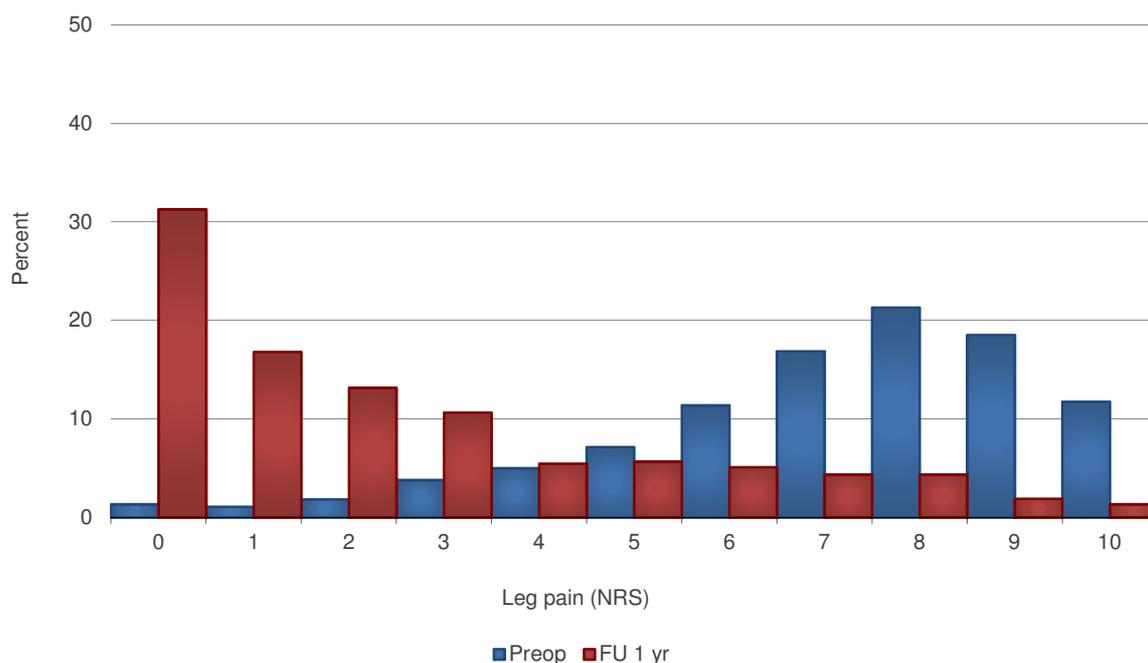


Fig. 18. Leg pain on the Numeric Rating Scale preoperatively and 1 year postoperatively in patients operated for lumbar disc herniation in 2016 (%).

Perceived improvement relating to back pain: Completely pain-free 20%, significantly improved 48%, somewhat improved 17%, unchanged 5% and worsened 4%; 6% did not have preoperative back pain.

Perceived improvement relating to leg pain: Completely pain-free 32%, significantly improved 41%, somewhat improved 15%, unchanged 6% and worsened 4%; 2% had no preoperative leg pain.

Overall patient satisfaction with surgical outcome: 75% were satisfied, 18% uncertain and 7% dissatisfied.

Use of analgesics one year postoperatively: Regular 17%, intermittent 32%, none 51%.

Ability to walk one year postoperatively: <100 m 5%, 100-500 m 8%, 500 m-1 km 11%, >1 km 76%, a substantial improvement compared with preoperatively.

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

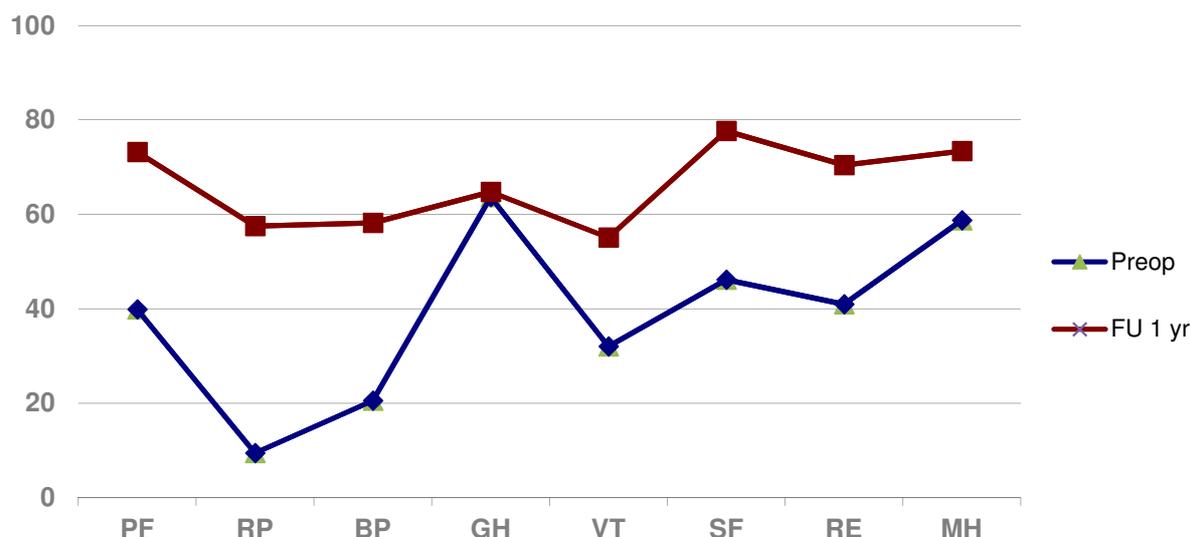


Fig. 19. SF-36 preoperatively and 1 year postoperatively for patients operated for lumbar disc herniation in 2016.

The results of the EQ-5D-analysis are presented both as EQ-5D 5, i.e. the answers to the 5 questions included in the questionnaire, and also on the VAS scale, the “thermometer.” The results for lumbar disc herniation are as follows: Mean EQ-5D 5 score preoperatively: 0.25, 1 year postoperatively 0.69. Mean EQ VAS score preoperatively (0-100): 46, 1 year postoperatively 70.

Central spinal stenosis operated in 2016 and followed up in 2017

This group includes 4,427 patients with a mean age of 68 (12–94) years.

Gender distribution: 47% men, 53% women.

Surgical intervention: Decompression alone midline sparing 9%, decompression non midline sparing 78%, decompression + posterior instrumented fusion 6%, decompression + posterior non-instrumented fusion 2%, other interventions 5%.

Mean preoperative NRS score for back pain was 6.0, compared with 3.5 at one year postoperatively. The corresponding figures for leg pain were 6.7 and 3.4 respectively. Figures 20 and 21 show preoperative and postoperative VAS for back and leg pain, respectively.

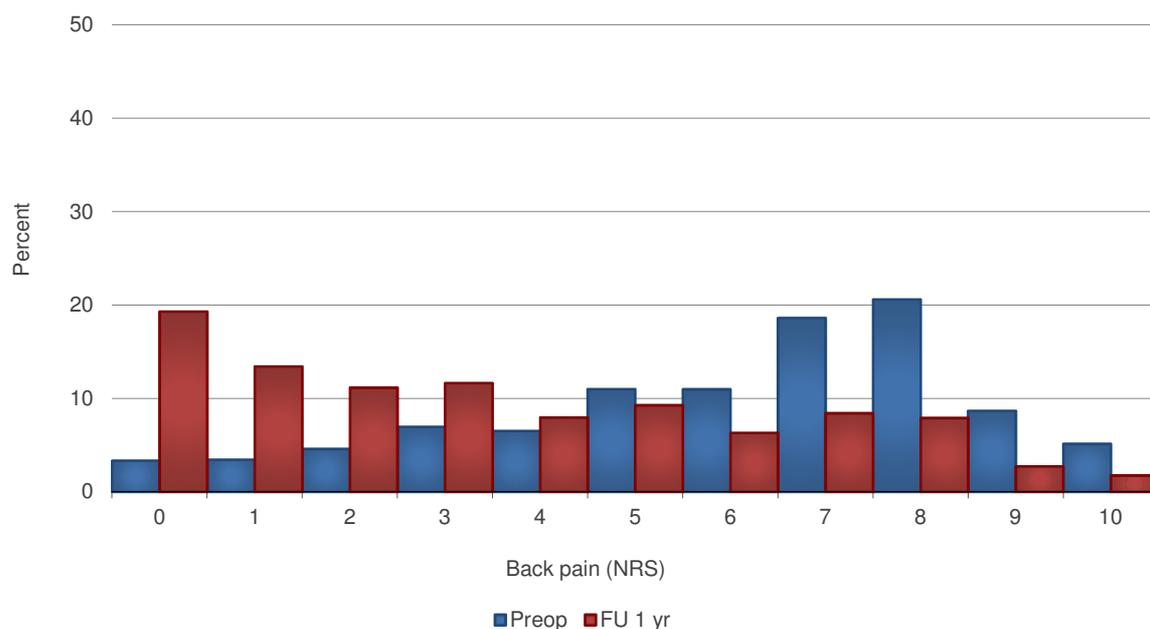


Fig. 20. Back pain on the Numeric Rating Scale preoperatively and 1 year postoperatively in patients operated for lumbar central spinal stenosis in 2016 (%).

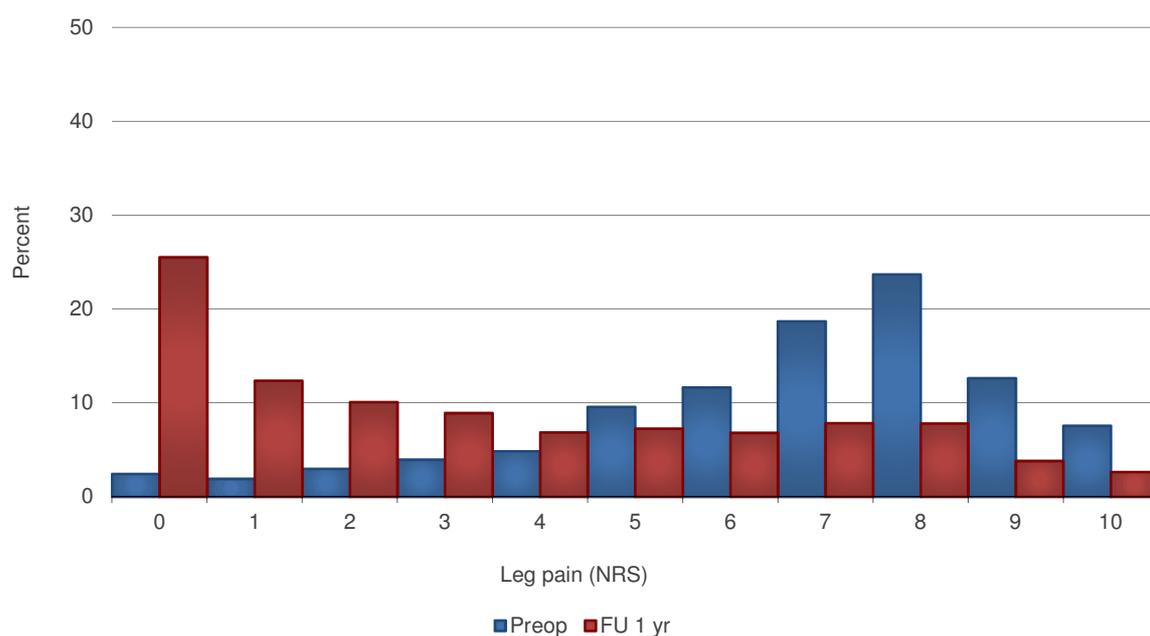


Fig. 21. Leg pain on the Numeric Rating Scale preoperatively and 1 year postoperatively in patients operated for lumbar central spinal stenosis in 2016 (%).

One year postoperatively, 17% of patients felt they were completely pain-free, 36% significantly improved, 19% somewhat improved, 12% unchanged and 8% deteriorated with regard to back pain; 8% had no preoperative back pain. The corresponding figures for leg pain were 26% completely pain-free, 28% significantly improved, 17% somewhat improved, 12% unchanged and 10% worsened; 7% reported no preoperative leg pain.

Overall patient satisfaction with the procedure was as follows: 64% were satisfied, 23% uncertain and 13% dissatisfied with the surgical outcome.

Analgesic use one year postoperatively: Regular 29%, intermittent 30%, none 41%.

Ability to walk one year postoperatively: <100 m 18%, 100-500 m 18%, 500 m-1 km 17%, >1 km 47%, a substantial improvement compared with preoperatively.

One year postoperatively patients in the central spinal stenosis category also demonstrated improvement of SF-36 score on all points except “General health.” The improvement was less pronounced than in disc herniation, but was 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 2016.

Mean EQ-5D 5 score preoperatively: 0.37, 1 year postoperatively 0.64. Mean VAS score preoperatively (max 100): 50, 1 year postoperatively 65.

Lateral spinal stenosis operated in 2016 and followed up in 2017

This patient group included 888 patients, 690 of whom were followed up for one year, with a mean age of 60 (22–88) years. Gender distribution was 49% men and 51% women. Decompression alone was used in 70% of cases, decompression + posterior fusion in 20% (18% instrumented and 2% non-instrumented), decompression + TLIF/PLIF 2%, and other procedures 8%.

Mean preoperative NRS score for back pain was 5.9, compared with 3.6 at one year postoperatively. The corresponding figures for leg pain were 6.8 and 3.6 respectively. Figures 23 and 24 show the distribution of preoperative and postoperative NRS scores for back and leg pain.

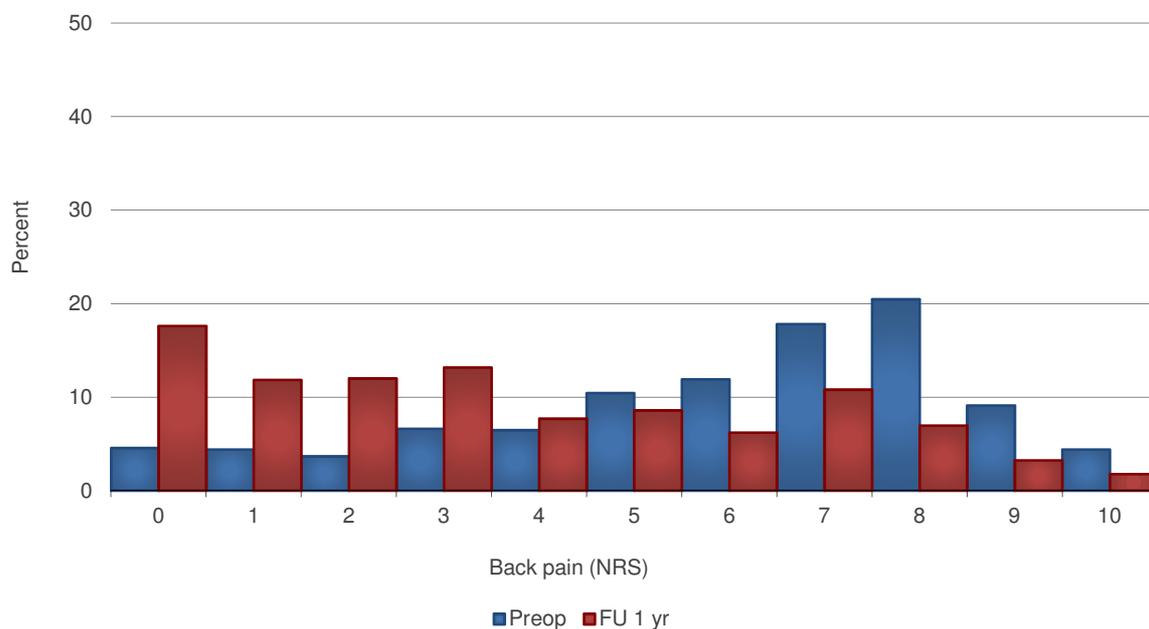


Fig. 23. Back pain on the Numeric Rating Scale preoperatively and 1 year postoperatively in patients operated for lumbar lateral spinal stenosis in 2016 (%).

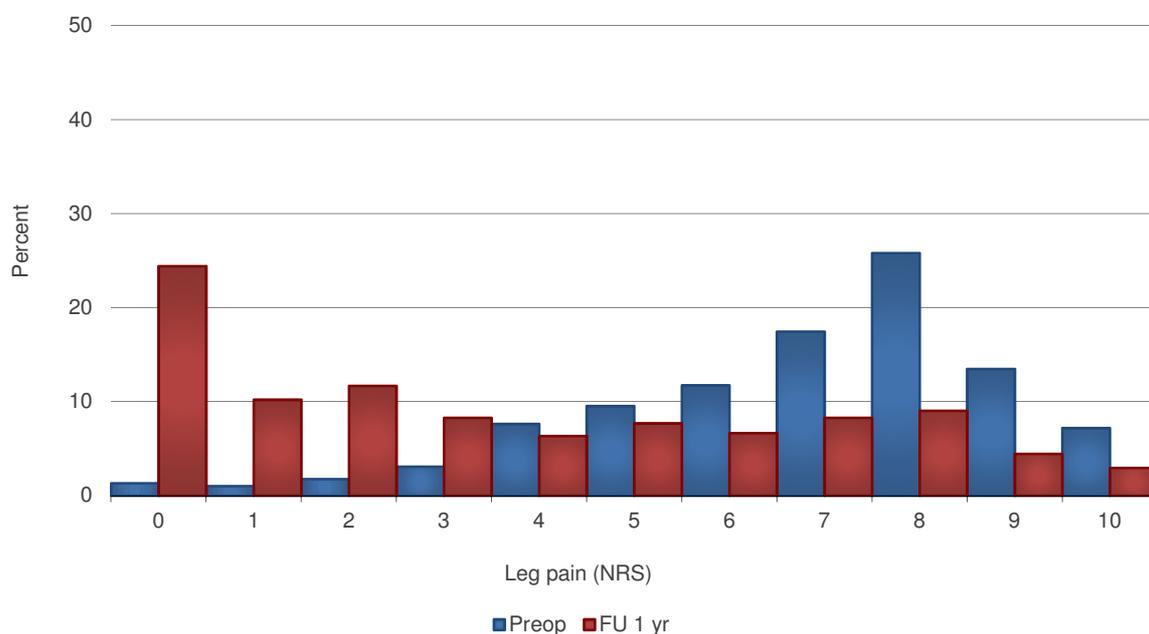


Fig. 24. Leg pain on the Numeric Rating Scale preoperatively and 1 year postoperatively in patients operated for lumbar lateral spinal stenosis in 2016 (%).

One year postoperatively 14% of patients were completely pain-free, 35% significantly improved, 22% somewhat improved, 13% unchanged and 8% experienced worsened back pain; 8% had no preoperative back pain. The corresponding figures for leg pain were 24%

completely pain-free, 31% significantly improved, 19% somewhat improved, 12% unchanged and 10% worsened; 4% had no previous leg pain.

Patient satisfaction with surgical outcome: 62% satisfied, 23% uncertain and 15% dissatisfied.

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

Ability to walk one year postoperatively: walking distance of <100 m 10%, 100–500 m 13%, 500 m–1 km 16% and >1 km 61%.

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

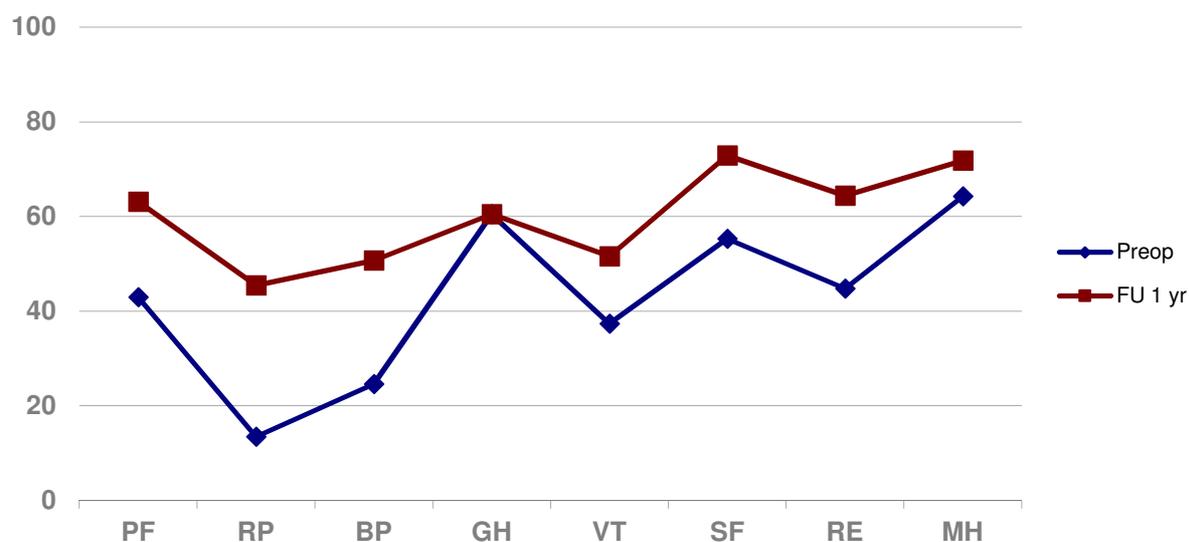


Fig. 25. SF-36 preoperatively and 1 year postoperatively for patients operated for lumbar lateral spinal stenosis in 2016.

Mean EQ-5D 5 score preoperatively: 0.35, 1 year postoperatively 0.62. Mean EQ VAS score preoperatively (max 100): 49, 1 year postoperatively 66.

Spondylolisthesis operated in 2016 and followed up in 2017

Of the 324 patients operated for spondylolisthesis during the period, 242 completed 1-year follow-up. Mean age was 50 (14–91) years; gender distribution 53% men and 47% women.

Among the patients with spondylolisthesis, 46% were operated with decompression and posterior instrumented fusion, 18% with posterior instrumented fusion alone, 4% with PLIF, 2% with decompression surgery alone, 8% with decompression + TLIF/PLIF, 3% with decompression + posterior non-instrumented fusion, and 19% other procedures.

Mean preoperative NRS score for back pain was 6.3, compared with 3.1 at one year postoperatively. The corresponding figures for leg pain were 5.2 and 2.7 respectively. Figures 26 and 27 show preoperative and postoperative NRS score relating to back and legs.

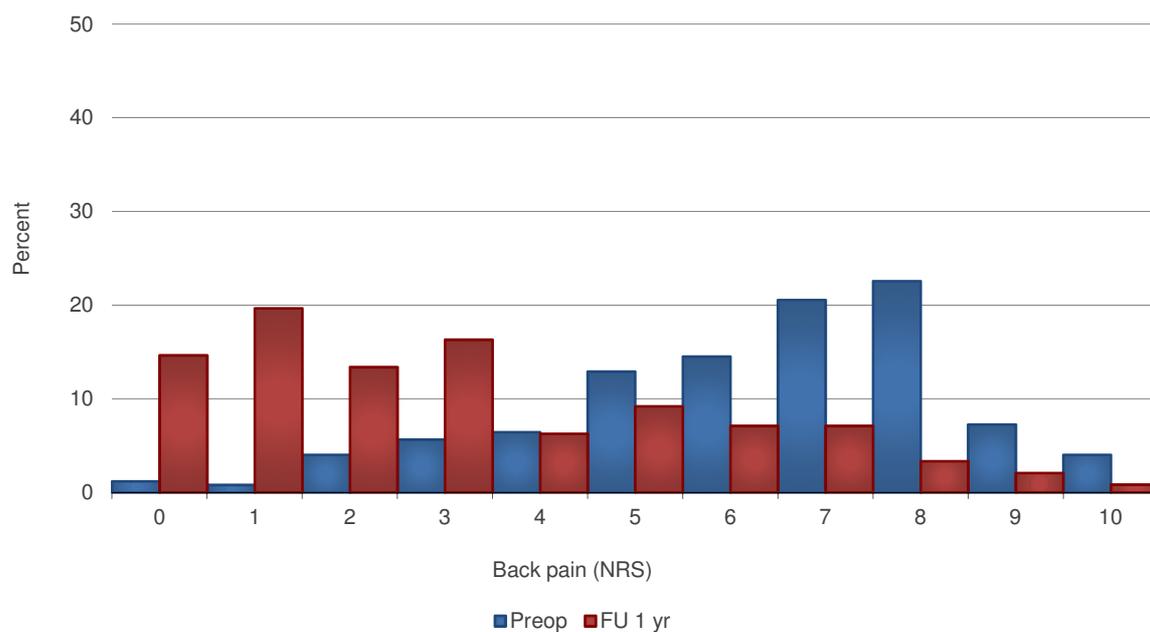


Fig. 26. Back pain on the Numeric Rating Scale preoperatively and 1 year postoperatively in patients operated for spondylolisthesis in 2016 (%).

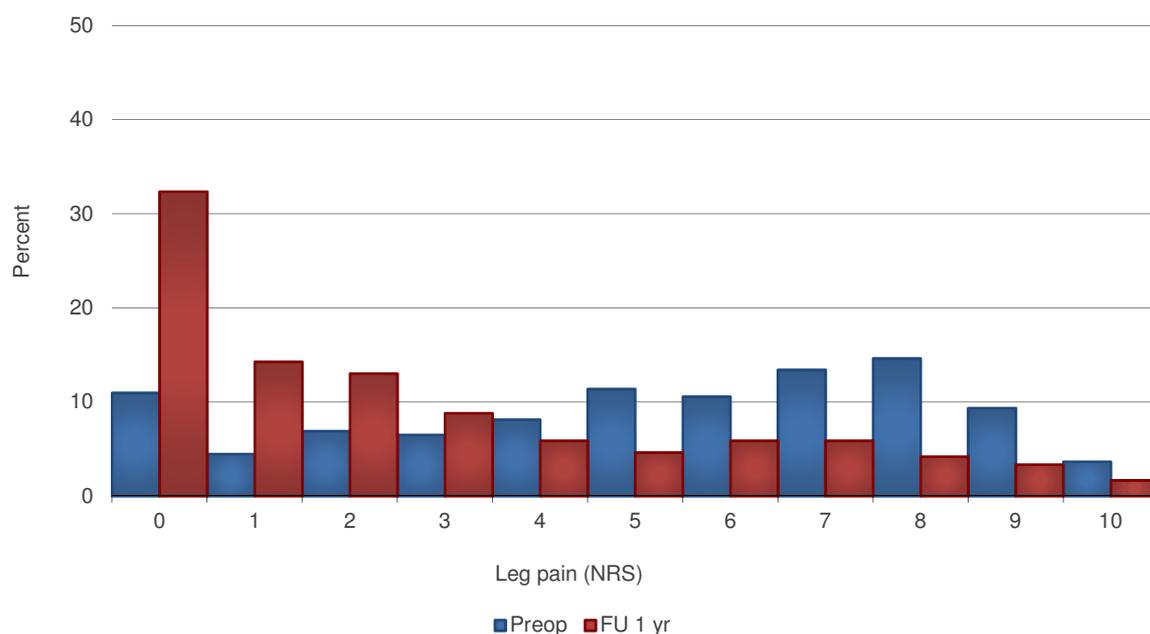


Fig. 27. Leg pain on the Numeric Rating Scale preoperatively and 1 year postoperatively in patients operated for spondylolisthesis in 2016 (%).

At the 1-year follow-up, 15% of patients felt they were completely pain-free, 42% significantly improved, 26% somewhat improved, 5% unchanged and 8% experienced worsened back pain; 4% did not have back pain previously. The corresponding figures for leg pain were 24% completely pain-free, 31% significantly improved, 16% somewhat improved, 7% unchanged and 9% worsened; 13% reported no preoperative leg pain.

Overall patient satisfaction with the operation: 68% satisfied, 20% uncertain and 12% dissatisfied.

Regular intake of analgesics one year postoperatively was reported by 21%, intermittent use by 38% and no intake of analgesics at all by 41%.

Ability to walk one year postoperatively: <100 m 7%, 100-500 m 9%, 500 m-1 km 15%, >1 km 69%, 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.

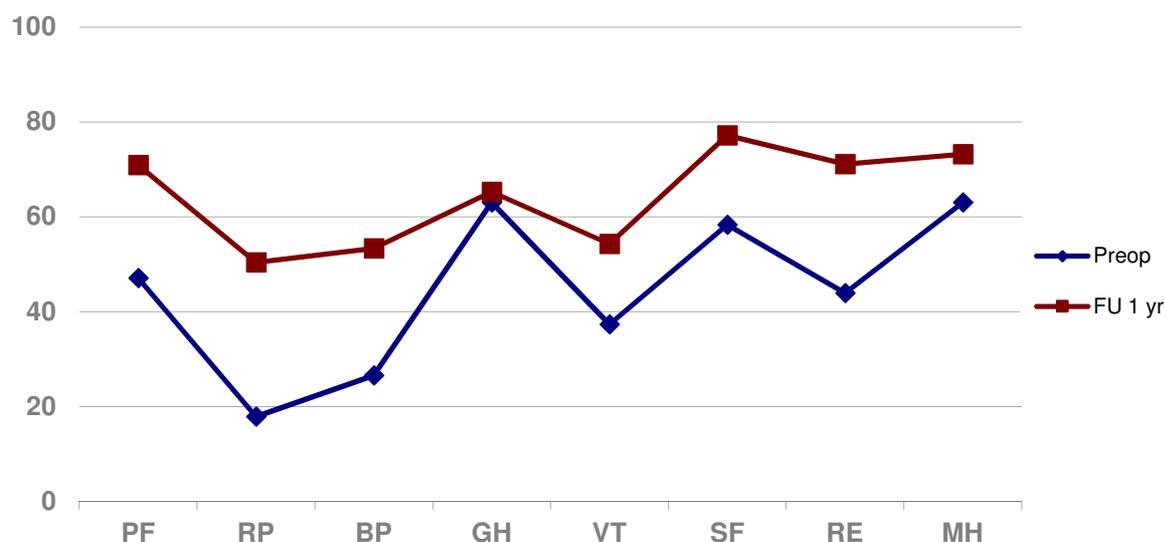


Fig. 28. SF-36 preoperatively and 1 year postoperatively for patients operated for spondylolisthesis in 2016.

Mean EQ-5D score preoperatively: 0.36, 1 year postoperatively 0.65. Mean EQ VAS score preoperatively (max 100): 50, 1 year postoperatively 69.

DDD/SP operated in 2016 and followed up in 2017

One-year follow-up was completed by 444 of 603 patients operated during the period. Mean age was 46 (18–90) years, gender distribution 47% men and 53% women.

In 31% of cases patients with DDD were operated with posterior instrumented fusion, in 24% with global instrumented fusion, in 10% with PLIF, in 12% with disc replacement, in 6% with decompression + posterior instrumented fusion, in 7% with decompression + TLIF/PLIF, in 2% with posterior non-instrumented fusion, and in 8% with other procedures.

Mean preoperative NRS score for back pain was 6.7, compared with 3.2 at one year postoperatively. The corresponding figures for leg pain were 4.1 and 2.1, respectively. Figures 29 and 30 show preoperative and postoperative NRS scores for back and leg pain.

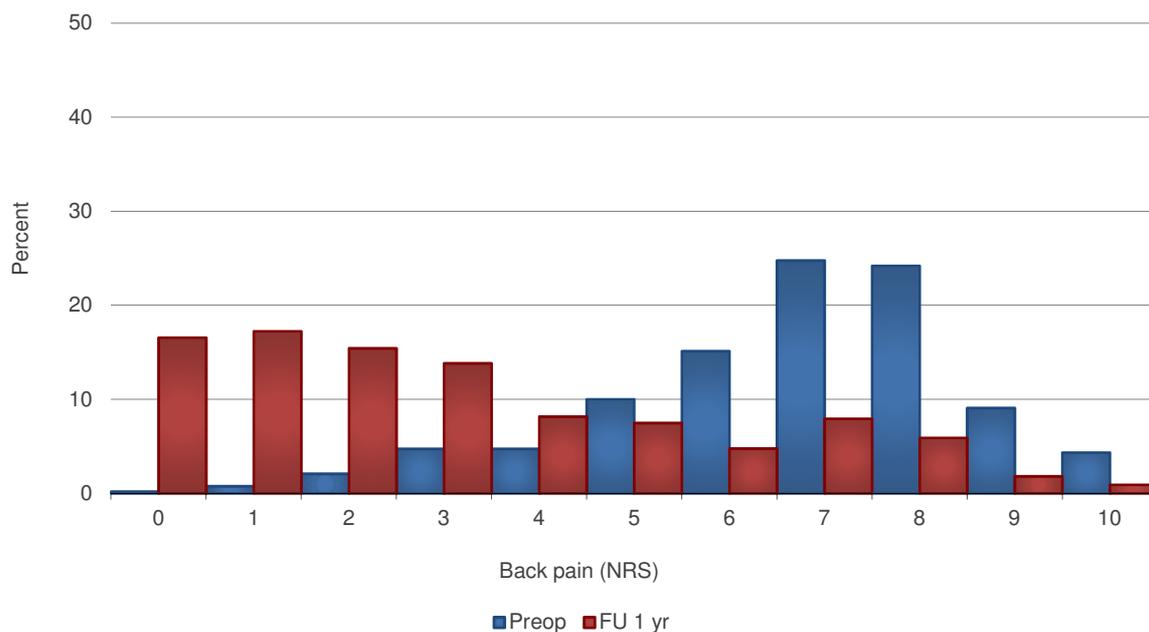


Fig. 29. Back pain on the Numeric Rating Scale preoperatively and 1 year postoperatively in patients operated for DDD in 2016 (%).

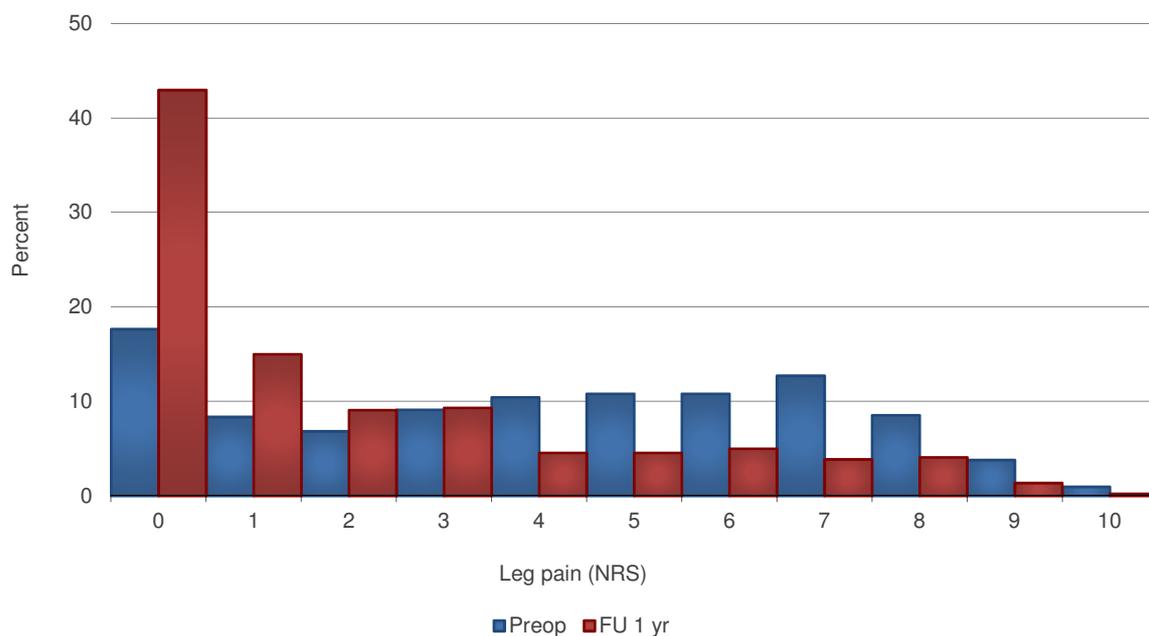


Fig. 30. Leg pain on the Numeric Rating Scale preoperatively and 1 year postoperatively in patients operated for DDD in 2016 (%).

One year postoperatively, patients operated for DDD perceived back pain as follows: Completely pain-free 18%, significantly improved 45%, somewhat improved 22%, unchanged 8% and worsened 6%; 1% did not have back pain previously (sic).

Leg pain: Completely pain-free 20%, significantly improved 50%, somewhat improved 16%, unchanged 6% and worsened 8%; 0.2% reported no preoperative leg pain.

Patient satisfaction with the procedure: 77% satisfied, 14% uncertain and 9% dissatisfied.

Analgesics Among these patients, 25% took analgesics regularly one year postoperatively, 30% did so intermittently and 45% reported that they did not use any analgesics.

Ability to walk one year postoperatively: <100 m 4%, 100-500 m 8%, 500 m-1 km 9%, >1 km 79%, a substantial improvement compared with preoperatively.

Function. Figure 31 presents the preoperative 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.

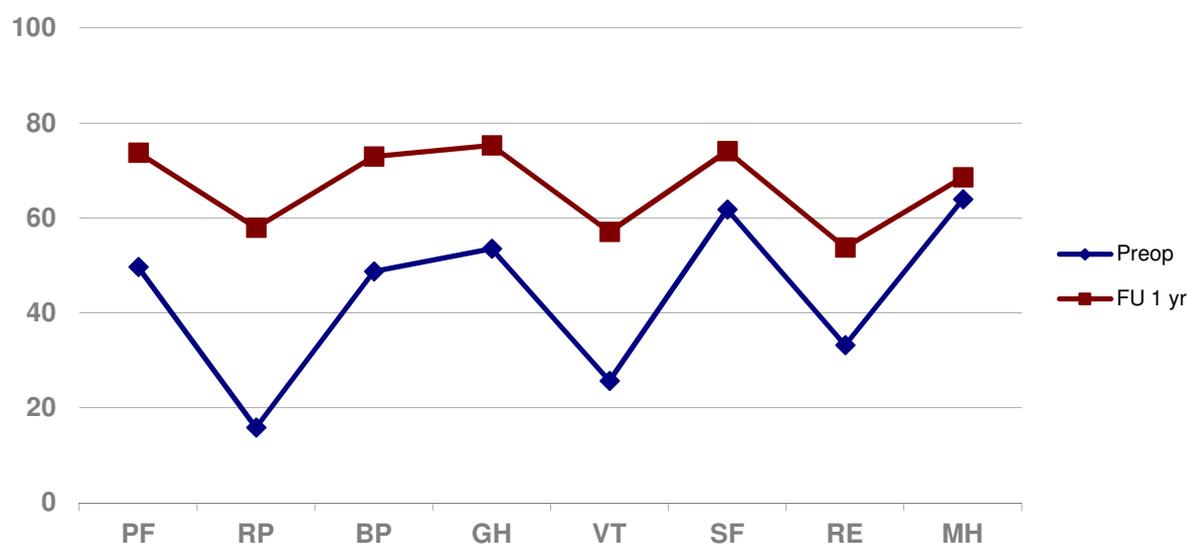


Fig. 31. SF-36 preoperatively and 1 year postoperatively for patients operated for DDD in 2016.

Mean EQ-5D 5 score preoperatively: 0.35, 1 year postoperatively 0.68.

Mean EQ VAS score preoperatively (max 100): 49, 1 year postoperatively 70.

Oswestry Disability index (ODI) preoperatively and 1 year postoperatively for all lumbar spine diagnoses

Below is a comparison of preoperative and postoperative “disability” as measured by the Oswestry index (ODI). All diagnoses show a significant reduction in measured functional limitation; most pronounced is disc herniation; see figure 32 An ODI score of about 22 is usually regarded as normal function, i.e. no or insignificant “disability,” while over 40 reflects severe disability.

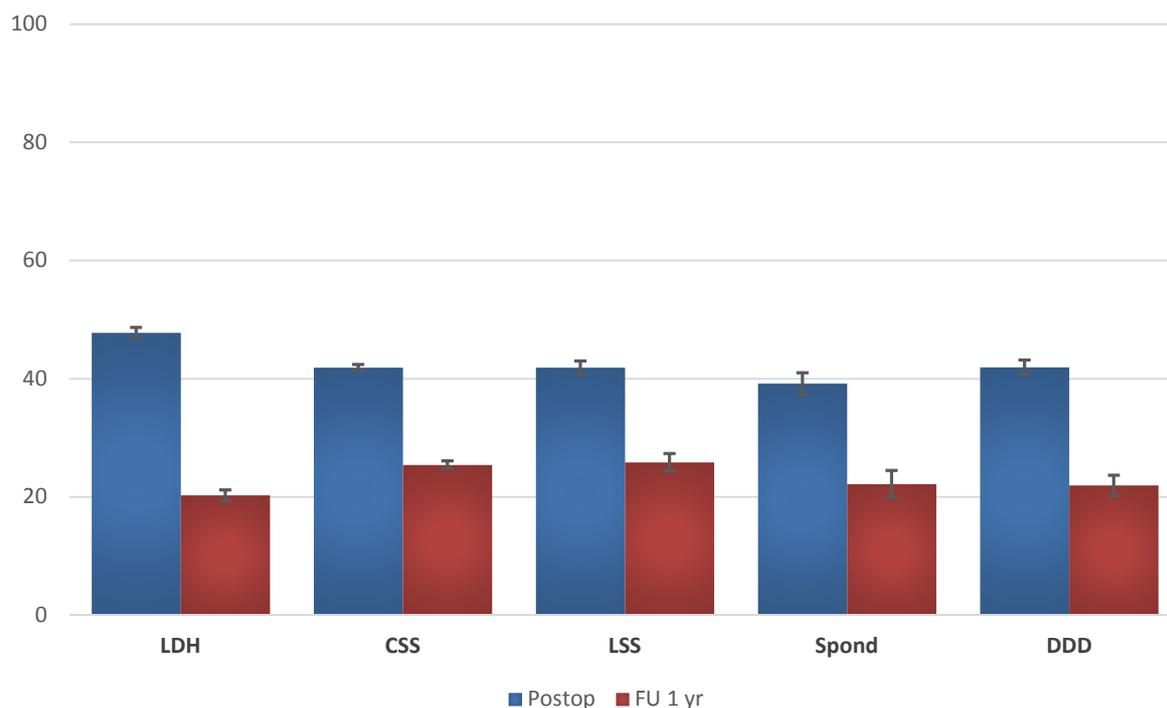


Fig. 32. ODI score before and one year after lumbar spine intervention, diagnosis-related, for patients operated in 2016.

Two-year follow-up in 2017 of patients who had lumbar spine surgery in 2015.

These figures were presented in earlier Annual Reports, but we have chosen not to include them this year because of the lack of relevant differences between the results at one and two years.

III. One, Two and Five-year follow-up of lumbar spine surgery carried out in 2012

A total of 3,497 patients completed 1, 2 and 5-year follow-up after having undergone surgery in 2012. The most common diagnoses are disc herniation, 917, and central spinal stenosis, 1,769 patients. In all, 250 patients had been operated for lateral spinal stenosis, 161 for spondylolisthesis and 292 for segmental pain (DDD). The remaining 108 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 presented (preop-1-2-5 year postop).

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

| | Back | | | | Leg | | | |
|------------------------------|-------|--------|---------|---------|-------|--------|---------|---------|
| | Preop | 1 year | 2 years | 5 years | Preop | 1 year | 2 years | 5 years |
| Disc herniation (LDH) | 4.7 | 2.2 | 2.3 | 2.6 | 6.7 | 2.0 | 2.1 | 2.3 |
| Central stenosis | 5.5 | 3.1 | 3.3 | 3.7 | 6.3 | 3.0 | 3.3 | 3.7 |
| Lateral stenosis | 5.0 | 3.2 | 3.5 | 3.7 | 6.2 | 3.4 | 3.5 | 3.8 |
| Spondylolisthesis | 5.9 | 2.9 | 3.1 | 3.2 | 5.2 | 2.5 | 2.7 | 2.9 |
| DDD | 6.3 | 2.7 | 2.9 | 3.2 | 4.2 | 2.2 | 2.4 | 2.6 |

Table 2. Walking distance, disc herniation (%)

| | Preoperatively | 1 year | 2 years | 5 years |
|----------------------|----------------|--------|---------|---------|
| < 100 m | 32 | 3 | 4 | 4 |
| 100 m – 500 m | 21 | 7 | 6 | 6 |
| 500 m – 1 km | 14 | 7 | 8 | 8 |
| > 1 km | 33 | 83 | 82 | 82 |

Table 3 Walking distance, central spinal stenosis (%)

| | Preoperatively | 1 year | 2 years | 5 years |
|----------------------|----------------|--------|---------|---------|
| < 100 m | 38 | 14 | 16 | 22 |
| 100 m – 500 m | 29 | 19 | 18 | 19 |
| 500 m – 1 km | 15 | 16 | 17 | 14 |
| > 1 km | 18 | 50 | 49 | 44 |

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

| | Preoperatively | 1 year | 2 years | 5 years |
|----------------------|----------------|--------|---------|---------|
| < 100 m | 28 | 11 | 9 | 16 |
| 100 m – 500 m | 32 | 15 | 16 | 14 |
| 500 m – 1 km | 15 | 18 | 17 | 10 |
| > 1 km | 24 | 57 | 58 | 60 |

Table 5. Walking distance, spondylolisthesis (%)

| | Preoperatively | 1 year | 2 years | 5 years |
|----------------------|-----------------------|---------------|----------------|----------------|
| < 100 m | 17 | 6 | 6 | 8 |
| 100 m – 500 m | 20 | 9 | 11 | 13 |
| 500 m – 1 km | 19 | 11 | 15 | 7 |
| > 1 km | 43 | 74 | 68 | 73 |

Table 6. Walking distance, DDD (%)

| | Preoperatively | 1 year | 2 years | 5 years |
|----------------------|-----------------------|---------------|----------------|----------------|
| < 100 m | 9 | 5 | 5 | 5 |
| 100 m – 500 m | 19 | 5 | 7 | 9 |
| 500 m – 1 km | 23 | 15 | 15 | 12 |
| > 1 km | 49 | 75 | 73 | 74 |

Table 7. Analgesic use disc herniation preop, 1, 2 and after 5 years (%).

| | Preoperatively | 1 year | 2 years | 5 years |
|---------------------|-----------------------|---------------|----------------|----------------|
| Regular | 63 | 13 | 13 | 14 |
| Intermittent | 26 | 32 | 34 | 34 |
| None | 10 | 55 | 53 | 51 |

Table 8. Analgesic use central spinal stenosis preop, 1, 2 and after 5 years (%).

| | Preoperatively | 1 year | 2 years | 5 years |
|---------------------|-----------------------|---------------|----------------|----------------|
| Regular | 52 | 26 | 28 | 30 |
| Intermittent | 31 | 32 | 31 | 31 |
| None | 18 | 42 | 42 | 39 |

Table 9. Analgesic use lateral spinal stenosis preop, 1, 2 and after 5 years (%).

| | Preoperatively | 1 year | 2 years | 5 years |
|---------------------|-----------------------|---------------|----------------|----------------|
| Regular | 51 | 25 | 25 | 26 |
| Intermittent | 29 | 32 | 37 | 32 |
| None | 20 | 42 | 39 | 42 |

Table 10 Analgesic use, spondylolisthesis preoperatively, 1, 2 and 5 years postop (%).

| | Preoperatively | 1 year | 2 years | 5 years |
|---------------------|-----------------------|---------------|----------------|----------------|
| Regular | 44 | 24 | 25 | 26 |
| Intermittent | 36 | 27 | 34 | 29 |
| None | 21 | 50 | 41 | 45 |

Table 11. Analgesic use DDD preoperative, 1, 2 and 5 years postop (%).

| | Preoperatively | 1 year | 2 years | 5 years |
|---------------------|-----------------------|---------------|----------------|----------------|
| Regular | 55 | 25 | 23 | 22 |
| Intermittent | 34 | 30 | 38 | 38 |
| None | 11 | 45 | 39 | 40 |

Table 12. Attitude toward surgical outcome 1, 2 and 5 years postop, diagnosis-related.

| | 1 year postoperatively | | | 2 years postoperatively | | | 5 years postoperatively | | |
|---|-------------------------------|-----------------------------|--------------------------------|--------------------------------|-----------------------------|---|--------------------------------|-----------------------------|--------------------------------|
| | Satisf ied | Uncer tain | Dissat isfied | Satisfi ed | Uncer tain | Dissa tisfie d | Satisf ied | Uncer tain | Dissatis fied |
| Disc herniatio n (LDH) | 81 | 14 | 6 | 81 | 14 | 5 | 81 | 13 | 5 |
| Central stenosis | 69 | 21 | 10 | 68 | 20 | 12 | 66 | 21 | 13 |
| Lateral stenosis | 68 | 19 | 13 | 69 | 19 | 13 | 68 | 19 | 13 |
| Spondylo listhesis | 74 | 17 | 9 | 73 | 20 | 8 | 73 | 15 | 12 |
| DDD | 76 | 16 | 8 | 74 | 17 | 9 | 77 | 14 | 9 |

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

Table 13. Mean EQ-5D preoperatively, 1, 2 and 5 years postoperatively, diagnosis-related.

| | Preoperativel y | 1 year postoperativel y | 2 years postoperativel y | 5 years postoperativel y |
|--|----------------------------------|--|---|---|
| Disc herniation (LDH) | 0.30 | 0.74 | 0.75 | 0.75 |
| Central stenosis | 0.40 | 0.66 | 0.65 | 0.62 |
| Lateral stenosis | 0.40 | 0.67 | 0.65 | 0.63 |
| Spondylolisthesi s | 0.38 | 0.67 | 0.67 | 0.66 |
| DDD | 0.36 | 0.67 | 0.68 | 0.68 |

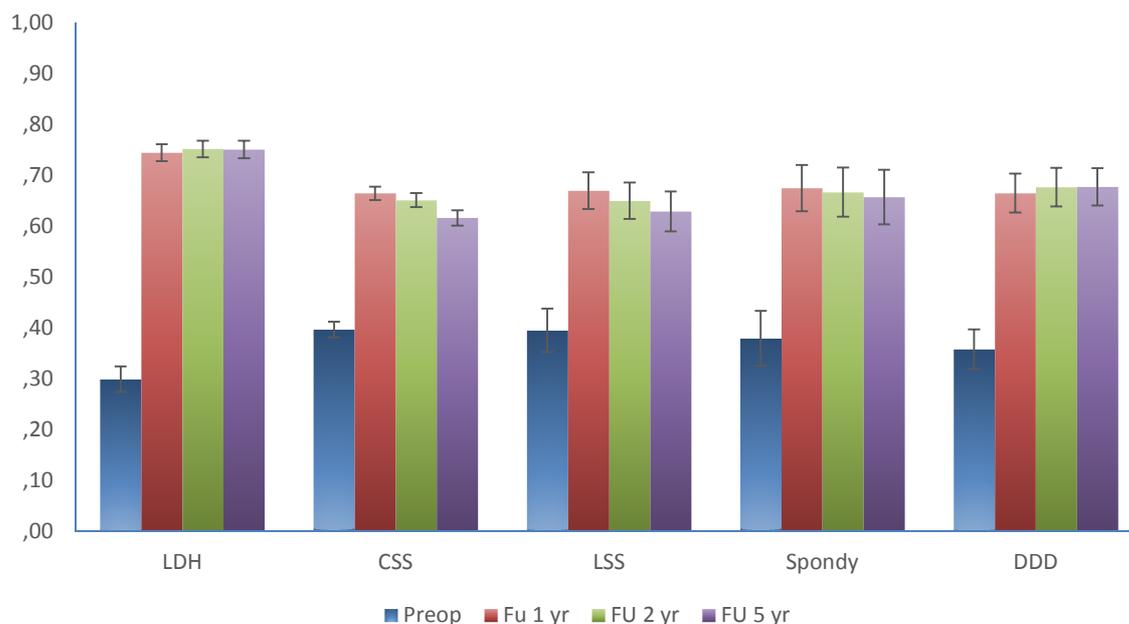


Fig. 33. Quality of life preoperatively, 1, 2 and 5 years postoperatively, as measured by EQ-5D, where 1="perfect" and 0="dead."

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

| | Preoperatively | FU 1 year | FU 2 years | FU 5 years |
|--------------------------|----------------|-----------|------------|------------|
| Disc herniation | 46 | 74 | 73 | 73 |
| Central stenosis | 49 | 66 | 65 | 63 |
| Lateral stenosis | 51 | 68 | 67 | 64 |
| Spondylolisthesis | 50 | 69 | 68 | 67 |
| DDD | 45 | 70 | 68 | 68 |

Oswestry Disability index (ODI) preoperatively and 1, 2 and 5 years postoperatively for all lumbar spine diagnoses, fig. 34.

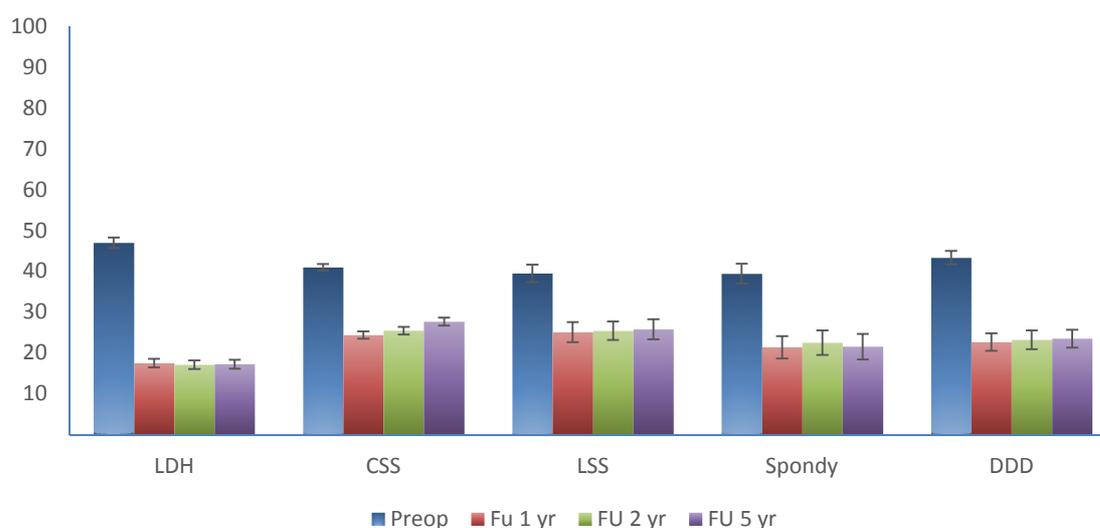


Fig. 34. ODI score preoperatively and 1, 2 and 5 years after lumbar spine intervention, diagnosis-related, for patients operated in 2012.

IV. Surgery for degenerative cervical spine disease 2017

In 2017, 1,330 patients were operated for degenerative cervical spine disease, including 51% men and 49% women. In all, 12% of the patients (955 had answered the question) were smokers and 16% had previously had cervical spine surgery.

Preoperative duration of pain, neck: <3 months 3%, 3-12 months 25%, 1-2 years 19% and more than 2 years 46%, while 7% denied any neck pain.

Preoperative duration of pain, arm: Patients experienced radiation of pain to the arm(s) as follows: 3% of patients for <3 months, 30% for 3-12 months, 23% for 1-2 years and 35% for more than 2 years, while 9% denied any arm pain.

Radiation of pain in thoracic spine: 3% of patients for <3 months, 17% for 3-12 months, 13% for 1-2 years and 30% for more than 2 years, while 37% denied any chest pain.

Regular analgesic use was confirmed by 53% of patients, intermittent by 29% and none by the remaining 18%.

Current walking distance was reported by 10% of patients to be <100 m, 11% 100-500 m, 14% 500 m – 1 km and 65% >1 km.

Fine motor function in hands: In all, 71% reported subjective deterioration of fine motor function in their hands.

Mean neck/chest pain on the NRS was 5.9.

Corresponding figure for arm pain was 5.6.

Quality of life: Mean EQ-5D was 0.38 for patients, while the results of the Neck Disability Index (NDI) were as follows: mean 42. Distribution on the European myelopathy score was 14.6.

Diagnoses were distributed as follows: Cervical disc herniation with rhizopathy: 34.6%. Cervical spinal stenosis myelopathy: 18.6%. Cervical foraminal stenosis with rhizopathy: 29.8%. Segmental neck pain: 0.2%. Rheumatoid arthritis: 0.6%. Cervical disc herniation with myelopathy: 10.2%. Disc degeneration/disc herniation with myelopathy in thoracic spine: 1.1%. Central spinal stenosis in thoracic spine 0.8%. Ankylosing spondylitis: 0%. Other diagnoses: 4.3%. Fig. 35.

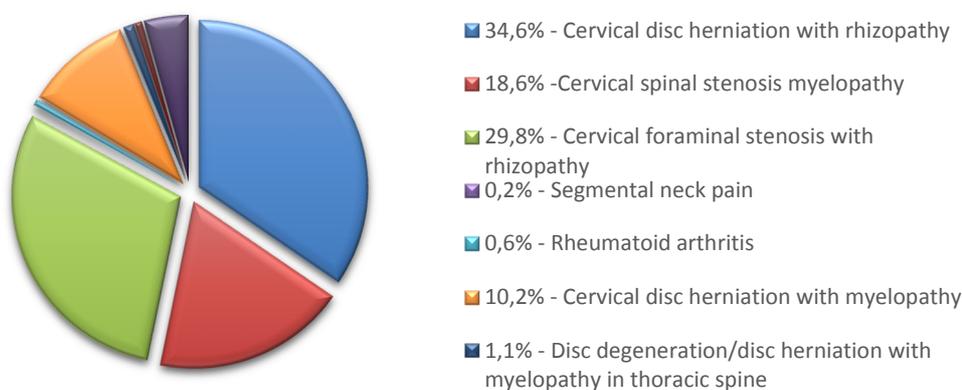


Fig. 35. Breakdown by diagnosis, degenerative cervical spine 2017, 1,330 patients.

Neurological clinical picture: 18% of patients had no neurological findings, 54% radicular involvement, 20% medullary involvement and the remaining 8% combined radicular and medullary involvement. On the **Ranawat score**, patients were distributed as follows: I: 34%, II: 41%, IIIa: 24% and IIIb: 1%. Neurological deficit according to the **Frankel Classification system** was distributed as follows: A 2%, B 0.3%, C 10%, D 52%, E 36%.

Instability: Horizontal instability between C1-C2 was seen in 1% of cases, vertical between C0 and C2 in 0.2% of cases and subaxial on some level, between C2 and Th1 in 2.2% of cases. Combined instability was assessed to be present in 0.2% of cases. No instability in 96.5% of cases.

Surgical interventions carried out as follows:

| | % |
|--|------|
| 1. Disk removal without fusion cervical spine (AC10/20) | .5 |
| 2. Disc removal with fusion without plate cervical spine (ABC10/20+NAG39) | 3.5 |
| 3. Disc removal with fusion with plate (ABC10/20+NAG49) | 10.1 |
| 4. Disc removal with fusion cage without plate cervical spine (ABC10/20+NAG49) | 27.0 |
| 5. Disc removal with fusion cage with plate cervical spine (ABC10/20+NAG49) | 20.1 |
| 6. Corpectomy and fusion with fixation (ABC21+NAK19) | 2.9 |
| 7. Disc replacement cervical spine (NAB90) | 1.6 |
| 8. Transoral decompression (ABC60+AAE99) | 0 |
| 9. Laminectomy without fixation cervical spine (ABC50) | 8.2 |
| 10. Laminectomy with fixation cervical spine (ABC50+NAG79) | 3.7 |
| 11. SKIP laminectomy cervical spine (ABC50) | .8 |
| 12. Laminoplasty cervical spine (ABC50) | 1.2 |
| 13. Foraminotomy cervical spine (ABC30) | 13.0 |
| 14. Combination laminectomy/laminoplasty and foraminotomy cervical spine (ABC30+ABC50) | 1.6 |
| 15. Posterior fixation without decompression cervical spine (NAG79) | 1.4 |
| 16. Anterior decompression of spinal cord in thoracic spine (ABC63) | .2 |
| 17. Posterior decompression of the spinal cord and nerve roots in the thoracic spine (ABC53) | 1.9 |
| 99. Other without impl (specify KVÅ procedure code) | 2.3 |

Anterior implant was used in 67% of cases and posterior in 8% of cases.

Outcome after 1 year: Myelopathy in cervical spine

In all, 201 patients were operated in 2016 for cervical central spinal stenosis with myelopathy and one-year follow-up was completed by 146 of them.

Mean preoperative **NDI** in Sweden was 40 and postoperative 33.

Subjective scoring of change in arm pain one year postoperatively:

Completely disappeared/significantly improved 33%, somewhat improved 17%, unchanged 19% and 15% felt worse, 16% had no arm pain before the procedure.

Patient assessment of walking distance one year postoperatively: <100 m 30%, 100-500 m 21%, 0.5-1 km 13%, >1 km 36%.

Overall patient satisfaction with surgical outcome: 53% were satisfied, 25% uncertain and 22% dissatisfied.

Quality of life as measured by EQ-5D improved from 0.30 preoperatively to 0.47 postoperatively at one year.

Outcome after 1 year: Rhizopathy from cervical spine

In 2016, 788 patients were operated for cervical disc herniation with rhizopathy or foraminal stenosis and 68% completed one year of follow-up

Mean preoperative **NDI** in Sweden was 45 and postoperative 27.

Change in arm pain one year postoperatively: Completely disappeared/significantly improved 60%, somewhat improved 18%, unchanged 12% and 6% felt worse, 4% had no arm pain before the procedure.

Assessment of walking distance one year postoperatively: <100 m 4%, 100-500 m 9%, 0.5-1 km 11%, >1 km 76%.

Overall patient satisfaction with surgical outcome: 68% were satisfied, 23% uncertain and 9% dissatisfied.

Quality of life as measured by EQ-5D improved from 0.38 preoperatively to 0.64 postoperatively at one year.

V. Spine fracture surgery

Since 2016 all spine fractures have been entered and followed up in the Swedish Fracture Registry (SFR)

For more information please see their website:
<https://stratum.registercentrum.se/#!/page?id=1094>

VI. Surgery for spinal metastases

In all, 104 patients were entered in the registry for surgery for spinal metastases in 2017; 18% were smokers. **Indications for surgery:** Neurological involvement 39%, back/leg pain 10%, progressive deformity 2%, neurological involvement + back/leg pain 35%, neurological involvement + progressive deformity 6%, back/leg pain + progressive deformity 2%, neurological involvement + back/leg pain + progressive deformity 5%; no indication for surgery was recorded for 1%.

The primary tumor was reported as known in 71% of cases.

Table 15 Primary tumor in spinal metastasis (percent)

| Primary tumor | Percent |
|---------------------------|---------|
| Prostate | 42 |
| Lung | 13 |
| Breast | 10 |
| Kidney | 7 |
| GI tract | 5 |
| Blood-forming organs | 8 |
| Thyroid | 3 |
| Other known primary tumor | 12 |

In 44% of cases a pathologic fracture was seen. Neurological involvement was distributed as follows on the Frankel Scale: A 3%, B 6%, C 34%, D 39%, E 18%.

Surgical procedures included posterior and anterior decompression as well as possible fusion. 91% had posterior decompression and 9% had anterior decompression. Stabilization with or without fusion was carried out in 57% of cases.

Resection of tumor was carried out in 79% of cases; in 7% of cases as wide excision, 18% marginal excision, 75% intralesional excision.

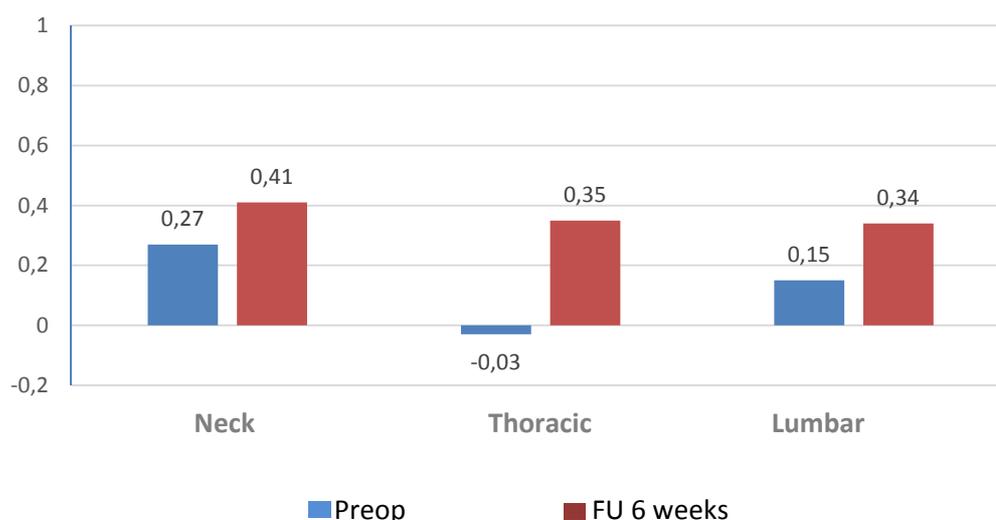


Fig. 36 Quality of life preoperatively, 6 weeks postoperatively, as measured by EQ-5D, where 1="perfect" and 0="dead." Operated 2015-2017

VII. CONCLUSION

Sweden currently has a world-leading spine surgery registry that covers the entire spinal column, with more than 125,000 index operations entered in the registry, especially concerning degenerative disorders. Since 2013, 10,000 new surgeries are added each year, which means that completeness is currently at 75%-80%. Registry data provide a basis for discussion regarding topics such as surgical indications for various back conditions, what surgical methods should be used and how patient-reported outcomes look, while also enabling health economics analysis of cost efficiency. Consequently, Swespine data provide valuable information to patients, spine surgeons, clinical directors, administrators and politicians.

In addition to cost-saving spinal surgery initiatives resulting from the shift away from expensive procedures to less expensive interventions with the same patient-reported outcome, use of registry data by spine surgeons, clinical departments and researchers has resulted in a constantly growing body of scientific publications and a number of these based on registry data. About 20 scientific articles published in international scientific journals in 2017-2018 were based in whole or in part on spine registry data; the total number is more than 100. We want to continue to encourage everyone interested in the Swedish Society of Spinal Surgeons to be active in this study process. It is not difficult to gain access to data when recognized research principles are followed.

International collaboration on registries also continues on many levels. For example in one large study, national data from Sweden, Norway and Denmark have been gathered in a common database located in Sweden. Several studies have been completed in which case-mix adjusted national results are compared. For example, Sweden, Norway and Denmark apparently use different indications for disc herniation surgery in the lumbar spine. The study investigating the most common spine surgery diagnosis, lumbar spinal stenosis, has been published and the study on treatment of lumbar disc herniation has been accepted. A study investigating chronic lumbar back pain is in the pipeline, as is a study comparing these registry results with results from RCTs.

The efficient registry office assists the clinical departments with patient follow-up, thereby guaranteeing a high follow-up rate, while providing considerable relief regarding the administrative burden on the various departments. It has also been shown that this service helps to improve the completeness of the registry data. However, due to reduced revenue from the government, we must gradually cut back on the number of active secretaries in the registry office. While we are currently testing online questionnaires submitted by patients to an increasing extent, we recognize that the registry office remains a valuable and desirable resource. Many of our operated patients are elderly and have little experience with the internet. The online questionnaire will be available to all operated patients beginning in the autumn of 2018.

The steering committee is actively working to increase the rate of use of the registry at the individual clinical departments, both in daily work for quality assurance and improvement purposes, as well as for research. Planned webinars and easily accessible online standard reports will facilitate this effort.

A “dialog tool” based on case-mix adjusted patient-reported registry data that will help clinicians and patients to discuss opportunities for improvement following surgery was put into general use in late 2017.

Since the spring of 2018 the public can view an open comparison of clinical departments and a case-mix adjusted report is also available on the SALAR “Healthcare in Numbers” platform. This will help our work with the registry in the future, since case-mix adjusted department results will be presented on an ongoing basis instead of just once a year in the Annual Report.

The affiliation of Swespine with the “Hub” as was previously announced has significantly helped with addressed follow-up questionnaires to our patients.

In summary, the steering committee and the registry office are working so that our unique spine surgery registry will be able to continue to produce data on an ongoing basis that can be used to benefit our patients, our profession and all involved stakeholders. The contributions of the registry secretaries, the doctors responsible for the registry and others who contribute to these activities are invaluable.

The steering committee and the Swedish Society of Spinal Surgeons would like to warmly thank everyone involved.

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IX. Presentations of Swespine data at national and international conferences May-Sept. 2018

"Follow-up of degenerative lumbar spine surgery - one year is enough. An equivalence study based on Swespine data". Catharina Parai. **ISSLS meeting i Bannff, Canada i maj-18.**

"Lumbal diskbråckskirurgi reducerar inte bara bensmärtn utan även ryggsmärtn"
Niyaz Hareni, Fredrik Strömqvist, Björn Strömqvist, Freyr Gauti Sigmundsson, Björn Rosengren, Magnus Karlsson. **SOF 2018**

"Quality of life in 1519 treated or untreated males and females with idiopathic scoliosis."
Diarbakerli E, Grauers A, Danielsson A, Abbott A, Gerdhem P. (Podium presentation), **SOSORT, Dubrovnik 2018.**

"Quality of life in 1519 treated or untreated males and females with idiopathic scoliosis."
Diarbakerli E, Grauers A, Danielsson A, Abbott A, Gerdhem P. (Podium presentation), **Eurospine, Barcelona 2018.**

"Long term outcome after lumbar disc herniation surgery at different ages." Lagerbäck T, Möller H, Gerdhem P. **Eurospine, 19-21 Sep, 2018, Barcelona, Spain.**

"Quality of life in 1519 males and females with idiopathic scoliosis." Diarbakerli E, Grauers A, Danielsson A, Abbott A, Gerdhem P. **Nordic Spinal Deformity Society, 23-25 Aug, Kolding, Denmark**