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Analysis of Predictors for Spinal Fusion in Degenerative Lumbar Stenosis in Chile Based on Diagnosis-Related Groups

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Abstract

Introduction: Degenerative Lumbar spinal stenosis (DLSS) is the most common cause of spine surgery for patients above 55 years. Surgery options include decompression alone or with spinal fusion. The DRG system uses classification algorithms that categorize patients into groups with similar clinical and resource consumption characteristics, using ICD-10 nomenclature for diagnoses and ICD-9-CM for procedures.

Objective: Identify clinical and epidemiological variables of DLSS surgery patients based on Chile's DRG system data and define factors associated with arthrodesis as a complement to decompression.

Study Design: Retrospective observational study.

Methods: This study used the national DRG database to analyze factors predicting the need for fusion in patients with DLSS. Data from 31 public hospitals in Chile were analyzed for patients discharged between 2020 and 2022. Variables considered included age, gender, presence of other spinal pathologies, and attending physician specialty. For the descriptive analysis of qualitative variables, frequencies and percentages were used.The study used univariate and multivariate logistic regression analysis. A statistical significance level of less than 0.05 was considered.

Results: We analyzed 1024 patients with lumbar spinal stenosis and found that 54.6% were female and 45.4% were male (p= 0.0034). The majority of the patients (57.4%) were aged between 60 and 79 years. 75% of orthopedic surgeons opted for decompression plus arthrodesis, while neurosurgeons preferred decompression alone in 73% of cases. The most significant predictors for decompression with fusion were the physician's specialty in orthopedic surgery, female sex, and the presence of other spinal pathologies such as scoliosis, herniated disc, and spondylolisthesis. Patients treated by an Orthopedic Surgeon had an 8.2 times greater probability of undergoing decompression plus arthrodesis as compared to those treated by a Neurosurgeon. Additionally, the presence of spondylolisthesis increased the probability of decompression with fusion by 6.2 times, and the

presence of scoliosis increased it by 6.6 times. Neurosurgeons opted for decompression alone in 89.7% of the cases with DLSS stenosis and herniated disc, while only 48.9% of orthopedic surgeons opted for the same option (p=0.0000).

Conclusion: Our study based on DRG records from public hospitals in Chile has identified certain factors linked to a higher frequency of spinal arthrodesis. These factors include the surgery being performed by orthopedic surgeons, patients aged between 40 and 60 years old, the presence of degenerative spondylolisthesis and degenerative scoliosis, and the absence of a herniated disc.

Introduction

Lumbar spinal stenosis (LSS) is a pathology where there is a narrowing of the spinal canal, that may compress nerve roots. Clinically expressed with lumbar pain radiating to the lower limbs and/or neurogenic claudication. LSS diagnosis has been increasing thanks to the use of Magnetic Resonance Imaging (MRI) and Computed Axial Tomography (CT scan). Degenerative lumbar stenosis (DLS) is the most common cause of spine surgery in patients over 55 years of age [1].

From an anatomical point of view, lumbar stenosis can be classified according to the location where the narrowing occurs: central, lateral recess, or foramina [2]. The most frequent cause is degenerative, affecting the facet joints and intervertebral discs, occasionally associated with pathologies such as scoliosis or spondylolisthesis [3].

There is currently no precise data on the prevalence of this condition. However, a meta-analysis published in the European Spine Journal in 2020 found that clinical diagnoses were present in 11% of the general population, while diagnosis through radiological imaging was present in 38%Most studies on the topic were conducted in North America, Japan, and Europe, which means they may not apply to the Chilean population. Additionally, 68% of the articles studied had a representativeness bias, indicating that the available information is limited. This suggests that more research is needed to fully understand the situation in Chile. [4].

Regarding treatment, the first preference should be conservative treatment. This includes the use of analgesics, NSAIDs or opioids, physiotherapy, and even infiltration of the spine with epidural steroid injections, and facet joint blocks. Surgery should be considered in severe cases where medical treatment has proven ineffective, and the patient is experiencing severe pain, neurological deterioration, and a decrease in their overall quality of life [5].

When surgery is decided, there are two options: surgery with decompression alone and surgery with decompression and spinal fusion (arthrodesis). It is important to note that Lumbar Fusion surgery typically involves the use of spinal instrumentation. Decompression surgery with or without fusion aims to relieve radicular pain, reduce low back pain, and improve quality of life. Currently, there are no clinical or epidemiological data available in Chile to predict the appropriate surgical technique, although numerous factors influence the decision-making process regarding which technique to use [6].

In 1982, a system called “diagnosis-related groups” or DRGs was created at Yale University by Dr. Robert B. Fetter and his team. It was developed to bring standardization to the healthcare industry, particularly regarding managing funds. The DRG system uses classification algorithms that categorize patients into groups with similar clinical and resource consumption characteristics, using ICD-9 and ICD-10 coding. This system helps hospitals quantify, standardize, and compare processes, generate indicators for benchmarking, and optimize health management systems. It’s considered to be the most accurate funding mechanism because it can assess the complexity of each hospital. Since 1982, DRGs have been used as a payment tool and have become widespread and diversified. They expanded worldwide in the 1990s and became the primary method of financing in Europe and Oceania. In Asia and Latin America, DRGs were introduced as a mixed method.

Chile is recognized as one of the most advanced countries in Latin America in the use of the DRGs system. In 2010, they implemented the “International-Refined DRG” (IR-DGR) system, which has been incorporated into the national financing policy through the budget law. FONASA, Fondo Nacional de Salud (it means National Health Fund), has included this system since 2020. Currently, GRDs have been implemented in 86 healthcare centers in the public network[10].

The following study aims to utilize the data available in the DRG system of Chile to identify the clinical and epidemiological variables of patients who undergo surgery for degenerative lumbar stenosis. This study aims to determine the factors that could influence the choice of using arthrodesis as a complement to decompression.

Material and Method

A retrospective observational study was conducted on patients with a diagnosis of lumbar or lumbosacral stenosis, obtained from the national database of diagnosis-related groups (DRGs), requested by the Transparency Law from the Chilean Ministry of Health.

The database includes information from 31 public hospitals in Chile, covering patients discharged between 2020 and 2022. The study variables were obtained from MBDS (Minimum Basic Data Set), which uses ICD-10-WHO (2013) nomenclature for diagnoses and ICD-9-MC 32.0 (2014) for procedures. The current classification system is IR-DRG, version 3.0.

The inclusion and exclusion criteria are described below:

Inclusion criteria
Age 40 years old or more
Contain at least one of the following ICD-10 diagnoses: M48.06 Spinal stenosis lumbar region M48.07 Spinal stenosis, lumbosacral region M99.33 Bone stenosis of the neural canal lumbar region M99.43 Stenosis of the neural canal by connective tissue lumbar region M99.53 Neural canal stenosis due to intervertebral disc in lumbar region M99.63 Bone stenosis and subluxation of intervertebral foramina lumbar region M99.73 Stenosis of intervertebral foramina by connective tissue or intervertebral disc in lumbar region
Present decompression surgery, associated with the ICD-9 code 03.09: Other spinal canal exploration and decompression.
Those patients presenting with arthrodesis had to be classified in the following procedure codes: 81.06 Lumbar and lumbosacral fusion of the anterior spine, anterior technique. 81.07 Lumbar and lumbosacral fusion of the posterior column, posterior technique. 81.08 Lumbar and lumbosacral fusion of the anterior spine, posterior technique.
Be classified in the following base IR-DRG: 01130 PH-Spinal and spinal procedures, and 08107 PH-Spinal fusion procedures except for spinal deviation.
Specialty of treating physician: orthopedic surgeon or neurosurgeon
Exclusion criteria
Diagnosis codes related to neoplasia or spinal cord trauma

The study aimed to identify variables predicting the need for fusion in patients with degenerative lumbar spinal stenosis, discussing their epidemiological and clinical features. The study considered the following factors: age, gender, presence of other spinal pathologies (such as scoliosis, spondylolisthesis, herniated disc, and degenerative osteoarthritis/arthrosis), and the specialty of the attending physician.

Statistical Analysis

For the descriptive analysis of qualitative variables, frequencies and percentages with 95% confidence intervals (CI) were used. The “difference of proportion hypothesis test” was used to assess significant differences between the two groups.

The study used the median and interquartile range to describe quantitative variables and the Mann-Whitney U test to compare groups.

The study used both univariate and multivariate logistic regression analysis to estimate Odds Ratios with a 95% CI. The stepwise method was used for the multivariate model, with a significance level of 0.05 and 0.1 for including and eliminating variables in the final model, respectively. The Hosmer-Lemeshow test was used to evaluate the goodness-of-fit of the model, and the area under the ROC curve was used to assess the discriminant capacity.

For all tests, a statistical significance of less than 0.05 was considered. Data were analyzed in STATA version 15.1 software.

Results

A total of 1024 patients were analyzed with lumbar spinal stenosis, out of which 54.6% (CI: 51.5-57.6%) were female and 45.4% (CI: 42.4-48.5%) were male (p= 0.0034). Among them, 39.1% were aged between 40 and 59 years, 57.4% were between 60 and 79 years, and 3.5% were 80 years or older (p=0.0000). The majority (51.1%) of patients with degenerative spinal stenosis underwent surgery in the metropolitan region, Santiago de Chile, and 48.9% in regional hospitals (p=0.5960). According to a study, 64.5% of patients who underwent surgery in Chile for degenerative lumbar spinal stenosis were operated on by neurosurgeons, while 35.5% were operated on by orthopedic surgeons (p=0.0000). This difference is mainly because, in regional hospitals, 86% of patients were operated on by neurosurgeons. In Santiago, 44% of patients were treated by this specialty (p=0.000).

We have identified several common health conditions among the patients. The data shows that 51.0% (CI: 47.9-54.0%) of patients have arterial hypertension, with an equal prevalence among men and women. Additionally, 20.1% (CI: 17.8-22.7%) of patients have non-insulin-dependent diabetes mellitus, with a slightly higher prevalence among women (18.1% men and 21.8% women; p=0.1414). Obesity of all types was found in 12.4% (CI: 10.5-14.6%) of patients, with a higher prevalence among women (9.0% men and 15.2% women; p=0.0027). Similarly, dyslipidemia was found in 11.4% (CI: 9.6-13.5%) of patients, with no significant difference in prevalence between men and women (10.3% men and 12.3% women; p=0.3159). Finally, hypothyroidism was found in 10.8% (CI: 9.1-12.9%) of patients, with a significantly higher prevalence among women (4.7% men and 15.9% women; p=0.0000).

The patients diagnosed with lumbar spinal stenosis frequently had other spinal pathologies associated with their condition. The most common among these were herniated discs, which affected 20.8% (CI: 18.4-23.4%) of patients, with a slightly higher prevalence in men (22.6%) than in women (19.3%) (p= 0.1952). Lumbar spondylolisthesis was found in 18.0% (CI: 15.7-20.4%) of patients, with a higher prevalence in women (22.9%) than in men (12.0%) (p=0.0000). Osteoarthritis and degenerative osteoarthrosis of the spine were found in 6.2% (CI: 4.8-7.8%) of patients, with similar prevalence in men (5.6%) and women (6.6%) (p=0.5071).

Regarding surgical treatment, 56.3% of the patients underwent decompression alone, while 43.7% underwent decompression and arthrodesis (p=0.0000).

We compared the baseline characteristics of the population and provided statistical comparisons between Decompression alone and Decompression with Fusion (Table 1).

Features	Total (N=1024)	Decompression alone (N=576)	Decompression with Fusion (N=448)	p-value
Gender				
Female	559 (54,6%)	289 (50,2%)	270 (60,3%)	0,0013
Male	465 (45,4%)	287 (49,8%)	178 (39,7%)	
Age				
40 to 59 years old	400 (39,1%)	212 (36,8%)	188 (42,0%)	0,0907
60 to 79 years	588 (57,4%)	339 (58,9%)	249 (55,6%)	0,2893
80 years and over	36 (3,5%)	25 (4,3%)	11 (2,5%)	0,1206
Common comorbidities				
Arterial hypertension	522 (51,0%)	283 (49,1%)	239 (53,4%)	0,1721
Non-insulin-dependent diabetes	206 (20,1%)	124 (21,5%)	82 (18,3%)	0,2049

Obesity	127 (12,4%)	62 (10,8%)	65 (14,5%)	0,0749
Dyslipidemia (High cholesterol)	117 (11,4%)	61 (10,6%)	56 (12,5%)	0,3432
Hypothyroidism	111 (10,8%)	61 (10,6%)	50 (11,2%)	0,7595
Arthrosis	54 (5,3%)	32 (5,6%)	22 (4,9%)	0,6197
Depression	47 (4,6%)	28 (4,9%)	19 (4,2%)	0,5956
Asthma	37 (3,6%)	16 (2,8%)	21 (4,7%)	0,1069
Rheumatoid arthritis	31 (3,0%)	14 (2,4%)	17 (3,8%)	0,1935
Peripheral vascular diseases (PVD)	28 (2,7%)	12 (2,1%)	16 (3,6%)	0,1458
Chronic obstructive pulmonary diseases (COPD)	27 (2,6%)	14 (2,4%)	13 (2,9%)	0,6192
Chronic kidney disease	23 (2,3%)	14 (2,4)	9 (2,0%)	0,6668
Insulin-dependent DM	17 (1,7%)	13 (2,3%)	4 (0,9%)	0,0844
Parkinson’s disease	14 (1,4%)	6 (1,0%)	8 (1,8%)	0,2711
Smoking	124 (12,1%)	63 (10,9%)	61 (13,6%)	0,1885
Spinal pathologies				
Herniated Disc	173 (16,9%)	136 (23,6%)	37 (8,3%)	0,0000
Lumbar spondylolisthesis**.	144 (14,1%)	30 (5,2%)	114 (25,4%)	0,0000
Arthrosis and degenerative osteoarthritis	63 (6,2%)	40 (6,9%)	23 (5,1%)	0,2330
Lumbar spondylolisthesis with Herniated Disc	40 (3,9%)	17 (3,0%)	23 (5,1%)	0,0858
Scoliosis***.	18 (1,8%)	3 (0,5%)	15 (3,3%)	0,0005
Attending physician specialty				
Orthopedic Surgeon	363 (35,5%)	91 (15.8%)	272 (60,7%)	0,0000
Neurosurgeon	661 (64,5%)	485 (84,2%)	176 (39,3%)	0,0000
Dural tear during surgery	32 (3,1%)	12 (2,1%)	20 (4,5%)	0,0292

*Herniated Disc with absence of lumbar spondylolisthesis and scoliosis;**Lumbar spondylolisthesis with absence of Herniated Disc and scoliosis; ***Scoliosis with absence of Herniated Disc and spondylolisthesis.

Table 1: Baseline characteristics of the population, by type of surgery.

We analyzed the length of stay (LOS) of patients who underwent decompression alone versus those who had decompression with fusion. We found a significant difference in the LOS between these groups (p<0.0000). Patients operated on by neurosurgeons who underwent decompression with fusion had a longer LOS compared to patients operated on by orthopedic surgeons (Table 2).

	Physician specialty		
Surgical Technique	**Orthopedic surgeon**	**Neurosurgeon**	p value
	Median ±IQR (days)	Median ±IQR (days)	
Decompression alone	2±2	2±3	0,4625
Decompression with fusion	4±3	5±5	0,0003

Table 2: Days of hospitalization (length of stay) for patients with lumbar spinal stenosis based on surgery type and specialty

Univariate analysis was performed to assess the association between each predicting factor and the surgical option for decompression with fusion. The most significant predictors of the univariate model were the attending physician's specialty in orthopedic surgery, female sex, and the presence of other spinal pathologies such as scoliosis, herniated disc, and spondylolisthesis (Table 3).

In our study, we found that 75% of orthopedic surgeons performed decompression plus arthrodesis on patients operated for lumbar stenosis, while neurosurgeons performed decompression alone in 73% of the cases when it did not consider other spine pathologies (such as spondylolisthesis or scoliosis).

The univariate analysis indicates that the probability of a patient with lumbar stenosis undergoing decompression plus arthrodesis increases 8.2 times if treated by an Orthopedic Surgeon compared to those treated by a Neurosurgeon.

Another variable that conditions the surgical decision in lumbar spinal stenosis is the presence of spondylolisthesis (in the absence of herniated disc and scoliosis), increasing 6.2 times decompression plus arthrodesis and 6.6 times in the presence of scoliosis (in the absence of spondylolisthesis and Herniated Disc).

Among patients diagnosed with both lumbar spinal stenosis and spondylolisthesis, 89.8% of those treated by an orthopedic surgeon and 71.8% of those treated by a neurosurgeon underwent decompression plus arthrodesis surgery (p=0.0089). On the other hand, in patients with spinal stenosis without spondylolisthesis, 64.6% of patients treated by an orthopedic surgeon and 35.4% of those treated by a neurosurgeon underwent decompression plus arthrodesis surgery. The difference was statistically significant (p=0.0000).

In patients with lumbar spinal stenosis and herniated disc, decompression is the predominant surgical decision by neurosurgeons, with a rate of 89.7%. However, for orthopedic surgeons, the rate reduces to 48.9% (p=0.0000).

Neurosurgeons tend to opt for decompression alone (75%) when treating patients with lumbar spinal stenosis plus spondylolisthesis with a herniated disc. On the other hand, orthopedic surgeons only choose this procedure 10% of the time (p=0.0000). This preference remains the same for spondylolisthesis without herniated disc cases treated by orthopedic surgeons. However, neurosurgeons tend to reverse their decision and opt for decompression plus instrumented arthrodesis (71.8%) in such cases.

Features	OR	95% CI	p-value
Gender			
Female	1,51	1,17 - 1,93	0,001
Age			
40 to 59 years old	1,24	0,96 1,60	0,093
60 to 79 years	0,87	0,68 1,12	0,293
80 years and over	0,55	0,27 1,14	0,109
Spinal pathologies			
Herniated Disc	0,29	0,20 - 0,43	0,000
Lumbar spondylolisthesis	6,21	4,06 - 9,50	0,000
Arthrosis and degenerative osteoarthritis	0,73	0,43 - 1,23	0,233
Lumbar spondylolisthesis with HNP	1,78	0,94 - 3,37	0,077
Scoliosis	6,62	1,90 - 23,00	0,003
Attending physician specialty			
Orthopedic Surgery	8,24	6,14 - 11,05	0,000

Table 3: Univariate analysis of predictors for the surgical alternative of decompression plus fusion in patients with lumbar spinal stenosis.

The predictive utility of the multivariate model was found to be 0.82. The model takes into account the following variables to determine the surgical option for decompression plus arthrodesis: Orthopedic Surgeon, presence of scoliosis, presence of spondylolisthesis, absence of herniated disc, and age between 40 to 59 years (Table 4).

Predictors	OR	CI (95%)	p-value
Orthopedic Surgeon	9,8	7,1-13,6	0,000
Scoliosis	7,9	2,0-30,5	0,003
Spondylolisthesis	7,5	4,7-12,1	0,000
Age 40 to 59 years	1,7	1,2-2,3	0,001
Herniated Disc	0,3	0,2-0,5	0,000

Table 4 shows the results of the multivariate analysis of predictors for the surgical alternative of decompression plus arthrodesis in patients with lumbar spinal stenosis. The constant value is 0.24 (CI of 0.18-0.31).

Discussion

The article presents Chile's first national study on degenerative lumbar stenosis using epidemiological data from the DRGs system. Additionally, it is the largest case record of this pathology in Chile.

Based on the literature, in most cases, in patients with degenerative spinal stenosis, decompression alone is preferred over decompression with arthrodesis. Approximately 56.3% of patients who undergo surgery for degenerative lumbar stenosis choose decompression, while 43.7% opt for decompression with fusion. This finding is consistent with numerous studies that support decompression alone as a better option. Arthrodesis is typically recommended for patients with lumbar spine instability, spondylolisthesis, scoliosis, complete or significant resection of the facet joints, and in cases where symptoms recur after a simple decompression procedure. [11].

A meta-analysis conducted by Li-Hui [12], decompression alone has been found to decrease hospital length of stay, estimated blood loss, and pain based on VAS score. Furthermore, several trials suggest that adding arthrodesis to decompression does not have

enough evidence to be preferred over decompression alone for degenerative lumbar spinal stenosis [11-13].

According to our study, the primary factors that predict decompressive lumbar surgery with arthrodesis in lumbar stenosis in Chile are: physicians who specialize in orthopedic surgery, the presence of scoliosis, the presence of spondylolisthesis, age range between 40 and 59 years, and the absence of herniated disc.

It has been observed that the attending physician is an important factor in deciding the type of surgery. The orthopedic surgery specialty was found to be the most relevant in this regard. Neurosurgeons tended to lean towards decompression alone, whereas orthopedic surgeons preferred decompression with arthrodesis. The probability of choosing the latter type of surgery increased by 9.8 times if the case was treated by an orthopedic surgeon. In a study conducted in 1997 by Kats et al., it was found that the surgeon in charge of the operation was the most significant predictor. However, the study did not investigate why one type of surgery was chosen over the other, and it did not specify the specialties of the physicians involved in each case. It can be inferred that the choice of surgery is related to the training and traditions of each specialty.

It is interesting to note that orthopedic surgeons performed 56% of the surgeries for spinal stenosis in Santiago de Chile, the country's capital. However, in other regions outside of Santiago, neurosurgeons carry out most surgeries (86%). This means that in Santiago, the most common type of surgery is decompression plus arthrodesis, whereas in other regions (out of Santiago), decompression alone is more prevalent. It is interesting to note that in Chile, there were four times more orthopedic surgeons than neurosurgeons in 2008 [15], yet the latter group performed the majority of spinal stenosis surgeries in the country. It could be argued that the lack of orthopedic spine surgery specialists outside of Santiago, compared to the availability of neurosurgeons in the regions or the greater number of neurosurgeons available to operate on patients with spine pathology in public hospitals, might be possible reasons for this situation. Nevertheless, the precise data regarding this is currently unknown.

The second most relevant predictor obtained in our study was the presence of spondylolisthesis and/or scoliosis, which are also strongly associated with an increased likelihood of performing surgery with decompression and spinal fusion, regardless of the specialty of the attending physician. It was found that spondylolisthesis alone would increase the likelihood of spinal arthrodesis by 7.5 times, while the presence of scoliosis alone would increase the probability of spinal arthrodesis by 7.9 times.

The role of scoliosis and spondylolisthesis in determining the appropriate type of surgery has been a source of debate in various studies. For instance, a study by Nasca in 1989 followed 114 patients who were surgically treated for degenerative lumbar stenosis for a duration of 24 to 108 months. The research concluded that patients with scoliosis and spondylolisthesis would benefit from spinal arthrodesis in addition to lumbar decompression surgery [16]. Another study published by Freyr G. et al. in the European Spine Journal in 2014 involved 1624 patients aged over 50, who were operated on between 2003 and 2010 due to lumbar stenosis and spondylolisthesis. The study found that patients with predominantly low back pain symptoms also could benefit from surgery with decompression and spinal fusion in terms of lower limb pain, low back pain, functionality (according to the ODI scale), and quality of life (according to the EQ-5D index) [17]

However, in 2023, a meta-analysis was conducted based on data from 5 randomized controlled trials and 2 prospective studies to determine the effectiveness of spinal fusion plus decompression in patients with mild degenerative spondylolisthesis [13]. The study concluded that the treatment did not show any superiority in function, improvement in low back pain and leg pain at 2-year follow-up. Other studies have also concluded that spinal fusion surgery in spinal stenosis associated with spondylolisthesis or scoliosis would not be significantly better [13, 18, 19].

Finally, a study published in 2017 examined whether patients with spondylolisthesis should undergo decompression alone or with fusion. The results showed that both procedures have their advantages and drawbacks. However, decompression with fusion was associated with higher patient satisfaction and lower leg pain scores. [20]. It remains unclear whether adding spinal fusion to surgeries for patients with lumbar stenosis associated with scoliosis or spondylolisthesis is beneficial. However, in Chile, according to our results, the addition of arthrodesis is preferred.

A third predictor for the type of spinal surgery to be performed is age. Patients between the ages of 40 and 59 are 1.7 times more likely to undergo decompression plus arthrodesis surgery. This age range typically includes patients who are still functional, less fragile, and have fewer comorbidities compared to older patients. As a result, adding spinal arthrodesis surgery in this age group does not significantly increase the risk [21].

In our study, the presence of spinal stenosis with herniated discs alone can impact the decision to undergo surgery. If only a herniated disc is present, surgery with decompression alone is preferred. When herniation is not associated with other degenerative diseases like spondylolisthesis or scoliosis, both neurosurgery and orthopedic surgery specialties prefer decompression alone, 90% for neurosurgeons and 52.8% for orthopedic surgeons. According to an article published by Hanley in 1995 [22], using spinal fusion for the sole reason of having HNP is controversial because it would not define degenerative instability.

We found that the surgical approach for patients with lumbar stenosis, HNP, and spondylolisthesis varied depending on the surgeon's specialty. Neurosurgeons preferred decompression alone in 71.4% of cases, while orthopedic surgeons opted for decompression with arthrodesis in 90% of cases. Therefore, it seems that the decision to perform spinal arthrodesis in these cases is more closely related to the presence of spondylolisthesis than the presence of herniated discs.

Other factors were present in this study, including being female, having comorbidities, and smoking. However, these factors did not significantly impact the type of surgery. One of the findings in the study was the relationship between being female and the likelihood of undergoing spinal arthrodesis surgery, which was found to increase by 1.5 times. This could be due to the association between female sex and spondylolisthesis, which is three times more prevalent in women than men [23].

In a study conducted by Bridwell, it was found that females had a higher risk of developing spondylolisthesis [24]. Therefore, the presence of spondylolisthesis would mostly determine the type of surgery required

Comorbidities such as arterial hypertension, diabetes, obesity, dyslipidemia, and hypothyroidism were presented in most of the patients included in the study. However, upon reviewing the prevalence of these conditions at the national level, we discovered that they were similar to those found in the study. For instance, the prevalence of hypertension in the study was 49.5%, which is comparable to the national level where it was 45.1% [25].

Regarding complications, we analyzed the rate of dural tear between both techniques, and we found a significant difference ($p<0.02$), with decompression and fusion having a higher frequency (4.5%) compared to decompression alone (2.1%)

We compared the length of stay (LOS) of patients who had decompression alone with those who had decompression with fusion. Our analysis showed that there was a significant difference in the LOS between these two groups. This finding is consistent with other studies in the literature. Furthermore, we studied the differences between patients operated on by orthopedic surgeons and neurosurgeons, and we found that there was no significant difference in the LOS for patients who underwent decompression alone. However, there was a significant difference in the length of stay for patients who underwent decompression with fusion. Specifically, the LOS was longer for patients who were operated on by neurosurgeons.

Conclusion

Degenerative lumbar stenosis is a condition that may require surgery. The surgical options available are lumbar decompression alone and decompression with arthrodesis.

According to our study based on DRG records from public hospitals in Chile, over the past three years, certain factors have been linked to a higher frequency of spinal arthrodesis in this condition. These factors include the surgery being performed by orthopedic surgeons, patients aged between 40 and 60 years old, the presence of degenerative spondylolisthesis and degenerative scoliosis, and the absence of a herniated disc.

This study represents the first analysis of degenerative lumbar stenosis using the DRG system, and it is currently the largest national case record of this condition in Chile.

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