FACTORS ASSOCIATED WITH PERSISTENCE OF PAIN IN LUMBAR STENOSIS SURGERY

FATORES ASSOCIADOS À PERSISTÊNCIA DA DOR NA CIRURGIA DE ESTENOSE LOMBAR

FACTORES ASOCIADOS A LA PERSISTENCIA DEL DOLOR EN LA CIRUGÍA DE ESTENOSIS LUMBAR

Luis Muñiz Luna[1], Christian Camargo Zetina[2], Hugo Vilchis Sámano[2], Karen Aida Ibarra Stone[3], Erika Silva Chiang[2]

1. "Hospital de Traumatología y Ortopedia Lomas Verdes", Edo. de México Poniente, Instituto Mexicano del Seguro Social, Mexico.
2. UMAE HTOLV, IMSS, Mexico.
3. Medical Doctor, Clinical Research Methodology Advisor, Ciudad de México, México.

ABSTRACT

Objective: The objective of this study was to determine the factors associated with the persistence of pain in patients operated on for lumbar stenosis. Method: One hundred and fifty-three patients were studied, divided into two groups: 1) Patients with persistent pain in varying degrees, 2) Patients without pain. Age, sex, affected levels, comorbidities, surgical risk, and type of surgical procedure were evaluated. Results: There were 108 patients in the group with pain and 45 in the group without pain. In the group with pain, there were 28 patients with diabetes mellitus, 31 smokers, and 28 alcohol-dependent patients, with a significant difference of p = 0.001 and an RR = 1.1. A simple widening procedure was performed in 48 patients in the group with pain and 12 patients in the group without pain, with RR = 0.8, and widening plus instrumentation was performed in 7 patients in both the with and without pain groups. Conclusion: The indication of a surgical procedure in patients with spinal stenosis must take many factors into account in addition to clinical factors and the segments affected, since these factors impact patient prognosis. In the multivariate analysis, the variable most closely associated with persistent pain was the procedure performed. ***Level of Evidence III; Case-control study.[g]***

Keywords: Spinal stenosis; Low back pain; Arthrodesis; Orthopedics; Evaluation of processes; Evaluation of results.

RESUMO

Objetivo: Determinar os fatores associados à persistência da dor em pacientes operados por estenose lombar. Método: 153 pacientes foram estudados em dois grupos: 1) Pacientes com dor persistente em graus variados; 2) Pacientes sem dor. Idade, sexo, níveis afetados, comorbidades, risco cirúrgico e tipo de procedimento cirúrgico foram avaliados. Resultados: 108 pacientes no grupo com dor e 45 no grupo sem dor. Diabetes Mellitus em 28 pacientes no grupo da dor. Grupo com dor positivo em relação ao tabagismo em 31 pacientes, 28 pacientes com alcoolismo, com diferença significativa de p=0,001 e um RR=1,1. Os procedimentos realizados foram: Aumento Simples em 48 pacientes dentro do grupo com dor e em 12 pacientes no grupo sem dor, com RR=0,8, Extensão mais instrumentação em sete pacientes no grupo com dor e em sete pacientes no grupo sem dor. Conclusão: A indicação do procedimento cirúrgico em pacientes com estenose espinhal deve levar em consideração muitos fatores, não apenas os segmentos clínicos ou afetados, uma vez que esses fatores têm um efeito prognóstico no paciente. Na análise multivariada, a condição mais associada à dor persistente foi o procedimento realizado. ***Nível de Evidência III; Estudo de caso-controle.[g]***

Descritores: *Estenose espinha; Dor lombar; Artrodese; Ortopedia; Avaliação de processos; Avaliação de resultados.*

RESUMEN

Objetivo: Determinar los factores asociados a la persistencia del dolor en pacientes operados por estenosis lumbar. Métodos: Se estudiaron 153 pacientes, en dos grupos: 1) Pacientes con persistencia del dolor en grados variables, 2) Pacientes sin dolor. Se evaluó edad, sexo, niveles afectados, comorbilidades, riesgo quirúrgico y tipo de procedimiento quirúrgico. Resultados: Ciento ocho pacientes en el grupo con dolor y 45 en el grupo sin dolor. Diabetes Mellitus en 28 pacientes del grupo con dolor. Grupo positivo tabaquismo con dolor en 31 pacientes, 28 pacientes con alcoholismo, con diferencia significativa de p=0,001 y un RR=1,1. Los procedimientos realizados fueron: aumento simple en 48 pacientes dentro del grupo con dolor y en 12 pacientes en el grupo sin dolor con RR=0,8, extensión más instrumentación en siete pacientes en el grupo con dolor y en siete pacientes en el grupo sin dolor. Conclusiones: La indicación del procedimiento quirúrgico en pacientes con estenosis espinal debe tomar en cuenta numerosos factores, no únicamente los clínicos o los segmentos afectados, ya que esos factores tienen un efecto pronóstico en el paciente. En el análisis multivariado la condición mayormente asociada a la persistencia del dolor fue el procedimiento realizado. ***Nivel de Evidencia III; Estudio de caso-control[g].***

Descriptores: *Estenosis espinal; Dolor de la región lumbar; Artrodesis; Ortopedia; Evaluación de procesos; Evaluación de resultados.*

Study conducted at the Spine Surgery Service of the Unidad Médica de Alta Especialidad Hospital de Traumatología y Ortopedia Lomas Verdes, México.
Correspondence: Av. Lomas Verdes 2165, despacho 916, piso 9, col. Santiago Occipaco, C.P. 53250, Naucalpan de Juárez, Edo. de México, México. luismuniz99@yahoo.com.mx

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INTRODUCTION

In 1949, a particular form of narrowing of the lumbar spine not associated with any other spinal abnormality was reported. A case series in which all the patients were men, with the age at onset of the symptoms ranging from 37-67 years was published describing a syndrome where the clinical symptoms were characteristic. When walking or standing, these patients presented signs and symptoms of cauda equina: bilateral radicular pain, changes in sensitivity, and deterioration of muscle strength in the lower limbs. When the patient was at rest, these symptoms disappeared and the neurological test was normal. It was not possible to recognize this abnormality radiographically, however, using myelography the appearance of an extradural compression was revealed, explaining the orthostatic phenomenon of the origin of the symptoms from an increase in compression while in the vertical position.[1]

Lumbar spinal stenosis describes a clinical syndrome of pain in the buttocks and lower limbs, which may occur with or without back pain, associated with a reduced space available for the neural and vascular elements in the spine. Symptomatic lumbar spine stenosis has provocative and palliative features. The provocative characteristics include exercise or positively induced neurogenic claudication. The palliative characteristics usually include symptomatic relief with forward flexion, sitting and/or lying down. Lumbar spinal stenosis should be considered in older patients who have a history of severe pain in the lower limbs, which improves or is resolved in the sitting and postural positions, with abnormalities, such as a broad-based gait, on physical examination. Physical findings that add to this consideration include thigh pain exacerbated with extension and neuromuscular deficit. Patients whose pain does not worsen with walking have a low probability of stenosis.[2]

Due to the relative unpredictability of surgical results in the individual patient, a good knowledge of the natural history of the lumbar spinal stenosis is crucial. It is also important to identify the factors that influence the course of the disease, such as age, sex, duration and type of initial clinical symptoms, and the location and severity of the stenosis.[3]

The first attempt to study the natural history of the disease was made in 1984. Entrapment of the lumbar nerve root inside the radicular canal was recognized using four criteria: 1) constant, severe pain from the root to the leg; 2) pain not relieved by bed rest; 3) minimum tension signs; and 4) patients older than 40 years of age. Two hundred forty-nine patients fulfilled the criteria.[4] Fourteen percent received one or more epidural steroid injections. Surgical decompression of the radicular canal was performed in 24 patients (10%), of whom only three had completely recovered in the one-year evaluation, while 15 had improved moderately and six remained without changes. The evolution of the 225 patients (90%) treated without surgery was assessed by means of a questionnaire via the mail, to which 75% responded. After three years, 78% still had some leg pain but most were not sufficiently bothered by it to undergo surgery.[4]

One study compared the clinical course of central lumbar stenosis in 44 patients treated surgically and 19 patients treated conservatively. Myelography was performed for all patients. The patients were divided into three groups according to the treatment and the severity of the stenosis according to the myelography: the 19 non-surgical patients had moderate stenosis and among the 44 surgical patients, 30 had moderate stenosis. The average follow-up was approximately 3 years in the non-surgical group and four years in the surgical group. Most of the non-surgical patients remained without change or improved; only 10% worsened as compared to 20% in the surgical group with moderate stenosis. In the final follow-up, there were no significant differences in the severity of the pain or the use of analgesics. However, there was a significantly greater increase in the ability to walk in the surgical group than in the non-surgical group. In the non-surgical group, 30% improved and 60% remained without changes, while following surgery 60% of the patients improved and 25% deteriorated. [5]

Both the general population and the medical community fully recognize that spinal impairment has an enormous economic impact on the global workforce and health system. However, although the social impact of spinal impairment is well-documented, very little is known about the impact of spinal impairment on the physical function of the patient. In people from 20 to 50 years of age, back pain is the most costly musculoskeletal problem and the most costly industrial injury. In the United States, it is the second only to the common cold as a reason for medical visits and the third-place reason for performing surgical procedures. In addition, the role that comorbidities play in patients with spine problems are not well known.[6-8]

Although the incidence of degenerative lumbar stenosis in the global population is not completely known, a recent report from the United States Agency for Healthcare Research and Quality suggests that 13% to 14% of the patients who go to a spine specialist may have bone stenosis serious enough to require surgical decompression. An unknown percentage of patients with milder grades of symptomatic stenosis also exists and certainly with a growing frequency among the elderly. These data indicate that the physicians and the health system must realize that the spinal patient's physical burden is often similar to or greater than that suffered by their patients with CHF, COPD, cancer, or orthopedic disorders. It should also be kept in mind that the presence of comorbidity modestly exacerbates this already low level of physical functioning. If we consider its high incidence together with its low therapeutic effectiveness, it is not surprising that although benign in nature, this pathology has become a serious health issue in Western society due to its high frequency and social, labor, and economic impact with professional, family, social, and psychological consequences for those who suffer from it, undermining their quality of life to the point where 29% of them suffer from depression. The psychosocial model in health sciences refers to etiological factors involved in low back pain. Lumbar pain follows an episodic course pattern marked by periods of remission and exacerbation. Its recovery, maintenance, and chronification depend on physical and psychological factors. Low back pain tends to be reduced with rest and inactivity. As 80% of the population presents lumbar pain at some point in life, it should be noted that in most cases, the pain disappears in a few days or weeks with the application of conventional treatments or even without treatment. However, around 10% of these patients develop a profile of chronic low back pain with a high level of disability.[9-11]

Regarding the dilemma around whether to offer surgical or conservative treatment to patients, we find that most medical publications deal largely with results after surgical treatment. Thus, we can mention that in a meta-analysis conducted by Turner et al. successful results were reported of between 26% and 100% of patients following surgery, but the average follow-up time was less than 4 years.[12]

Another study reports good surgical results in 68% of the patients after an average long-term follow-up of eight years. The proportion of unsatisfactory results was 33%, but this decreased to 20% when only the patients who had satisfactory short term results were considered. None of the patients with short-term unsatisfactory results improved over time. The literature on results following non-surgical treatments is scarce.[13]

One study compared patients treated surgically with those treated conservatively and found that 60% of the surgically treated patients improved and 25% deteriorated, while 30% of the patients treated conservatively improved and 60% experienced no change. The average observation times were 53 and 31 months, respectively. In another study, they investigated the natural course of spinal stenosis and found that, after an average observation period of 49 months, the symptoms remained unchanged in 70%, improved in 15%, and worsened in 15% of the patients. No evidence of deterioration was found after 4 years and it was concluded that expectant observation could be an alternative to surgical treatment.[14]

Controlled clinical studies that compare conservative and surgical treatment are rare and few studies deal with long-term outcomes.

Some guidelines are suggested for the management of patients with symptomatic lumbar spinal stenosis:

1. If the pain is moderate, conservative treatment;

2. Patients with severe pain and those for whom a conservative approach did not have satisfactory results should be offered surgical treatment;
3. Predictors of the outcome of treatment, be it surgical or conservative, are not available. In particular, physicians should not commit the error of attributing a poor prognosis to a patient based only on the radiological demonstration of severe degenerative spinal changes, nor does this finding reinforce the indication for the surgery.

Regarding the factors that influence the prognosis of patients suffering from stenosis of the lumbar spine, it can be stated that it is a debilitating and chronic condition that typically affects adults in their 50s and 60s leading to substantial disability, where activities that require walking are often avoided and the quality of life related to health is reduced.

A study conducted in 2012 found that a higher body mass index (BMI) predicted less participation and ability to walk in the community. While pain was the strongest predictor of walking ability, the BMI was a stronger predictor of community walking. This implies that while pain limits what you can do in a testing environment, the BMI limits what you actually do in your daily life. Due to their age and their symptoms, people with lumbar spinal stenosis can potentially have serious problems in keeping their weight under control. It was found that pain was the most significant predictor of the walking ability and a strong predictor of walking performance. The relationship between pain and walking is well-known and the severity of the pain was also found to have a significant inverse relationship with walking in patients with low back pain and asymptomatic control subjects.[15] Pain reduction is one of the main objectives of treatment in lumbar spinal stenosis, traditionally focusing on physiopathology with injections and surgery.

A meta-analysis of surgery in canal stenosis could not identify prognostic factors, probably due to methodological deficiencies in the bibliography published up until that time.[12] Another meta-analysis compared surgical procedures in degenerative lumbar spinal stenosis and found that patients with multiple symptoms had worse outcomes regardless of the type of surgery performed, indicating a preoperative factor independently associated with the postoperative clinical outcome.[16]

In a study conducted in 2006, depression, cardiovascular comorbidity, disorders that influence the ability to walk, and the presence of scoliosis turned out to be prognostic factors for a worse result. However, having good walking ability, a subjective self-perception of being in a good state of health, a higher level of economic income, the absence of comorbidity, and the presence of a pronounced central stenosis were predictive of a better clinical result. In addition, being male and of a young age were associated with better walking ability in the postoperative period. No prognostic value was observed in educational level, clinical exploration data, marital status, type of work (sedentary or physically demanding), presence of obesity, sick leave, or tobacco consumption.[17]

In 1999, a study reported worse outcomes in females than in males.[18] On the other hand, a study of prognostic factors found that patients with unrealistic presurgical expectations had a lower level of satisfaction with the result.[19]

Finally, we can mention that age, the presence of obesity, and the subjective perception of the patient regarding the state of their health were not influential in the results of any of the models.

Several surgical procedures have been described for the treatment of lumbar spinal stenosis with high complication rates and without having an accurate knowledge of which factors change the evolution of these patients.

Because pain is one of the main indicators for surgical treatment, it is appropriate to identify the specific determinant of the patient and of the surgical procedure that are plainly associated with the persistence or absence of pain following surgery. The objective of this study is to understand the factors associated with the persistence of pain in varying degrees or, in its absence, after a surgical intervention to treat lumbar spinal stenosis.

METHODS

This is a retrospective longitudinal analytical cohort study in which we evaluated the medical records of a total of 153 patients diagnosed with lumbar spinal stenosis who were treated in the Spine Surgery Service of the Unidad Médica de Alta Especialidad Hospital de Traumatología y Ortopedia Lomas Verdes over a period of two years. Using the clinical records to collect the information, they were divided into two groups: 1) Patients with persistent pain in varying degrees. 2) Patients without pain. In each group we studied BMI, age, sex, affected levels, comorbidities, surgical risk, pre- and postoperative presence or absence of spondylolisthesis, pre- and postoperative presence or absence of scoliosis, as well as which of the surgical procedures – widening, widening with instrumentation, widening with arthrodesis, or 360° arthrodesis – was performed. The categorical variables were expressed as frequencies and percentages (%). The chi square test was used to compare them and relative risk (RR) was used to calculate their index of association. The quantitative variables were expressed as means ± SD and the Student's t or Wilcoxon test was used for their comparison depending on the distribution of the sample. Statistical significance was considered when $p \leq 0.05$. For the analysis, we used the Stata/SE 12.0 statistical package. This study is retrospective, descriptive, observational, and non-interventionist and therefore did not require review by the Institutional Review Board or informed consent. This research study is safe and considered to be of less than minimal risk according to the norm that establishes the provisions for health research of the Mexican Social Security Institute. All the data obtained was used only by the investigative team in such a way that the confidentiality and identity of the patients were protected.

RESULTS

A total of 153 patients, 77 male and 76 female, with an average age of 61 years and ranging from 48-81 years of age were included. There were 108 patients, 54 women and 54 men, with an average age of 62 years in the group with pain and 45 patients, 23 men and 22 women, with an average of 60 years of age in the group without pain. When a comparison was made of both groups by sex, a $p=0.01$ with an $RR=0.99$ was obtained for the males. The difference in age was not significant.

As regards active work life, we compared 37 patients in the group with pain and 5 patients in the group without pain which yielded an $RR=1.2$, with $p= 0.02$.

In the measurement of the months of evolution of the condition in the group of patients with pain, we obtained a mean of 26.2 months, while in the group without pain we obtained a mean of 15.2 months.

Only one patient, who belonged to the group of patients with pain, received corticosteroid therapy showing an $RR=1.4$ and not being significant.

Forty patients in the group with pain and 18 patients in the group without pain received physical rehabilitation. Two patients in the group without pain were readmitted to the hospital for superficial infection of the surgical wound. (Table 1)

Somatometry. The mean height was 161 cm in the group with pain and 162 cm in the group without pain. The mean weight was 73.4 kg for the patients in the group with pain and 75.9 kg for the patients without pain. The mean BMI was 28.1 ± 3.3 in the group with pain and 28.8 ± 3.8 in the group without pain with a significant difference with $p=0.04$. In the group of patients with pain, 14 patients had a BMI < 25, 63 patients were overweight, 28 patients were obese class I, and 3 patients were obese class II. In the group without pain, 6 patients had a BMI < 25, 25 were overweight, 12 were obese class I, and 2 patients were obese class II, with a statistical difference between the groups of $p=0.04$. (Figures 1 and 2)

Comorbidities and drug addiction. Diabetes Mellitus (DM) was present in 28 patients in the group with pain and in 14 patients in the group without pain. Systemic arterial hypertension (SAH) was present in 47 patients in the group with pain and 18 patients in the group without pain, cardiopathy (C) in three patients in the group

Table 1. Analysis of the relative risk for presenting pain.

	RR (p)
Sex: Male, female	0.99 (0.9), 1 (0.9)
BMI: Normal weight, overweight, obese class I, obese class II	0.99 (0.9), 1 (0.8), 0.99 (0.9), 0.85 (0.6)
Actively working	1.2 (0.02)
Rehabilitation	0.97 (0.8)
Readmission	0 (0.03)
Smoking	0.95 (0.6)
Alcohol abuse	1.1 (0.1)
DM	0.94 (0.6)
SAH	1 (0.7)
Cardiopathy	0.85 (0.6)
PVD	1.2 (0.3)
Dyslipidemia	1.4 (0.1)
Hypothyroidism	0.70 (0.3)
Other comorbidities	1 (0.8)
Corticosteroid therapy	1.4 (0.5)
ASA I, II, III, and IV	1.4 (0.3), 0.98 (0.8), 0.97 (0.7), 1.4 (0.2)
Goldman I, II, III, and IV	0.87 (0.2), 1 (0.6), 0.85 (0.6), 1.4 (0.1)
Presurgical spondylolisthesis Grade I, II, III	0.88 (0.3), 1.1 (0.5), 0.70 (0.5)
Surgical procedure: A. Descompression B. Descompression with Instrumentation C. Descompression with Instrumentation and Arthrodesis D. 360°degree Arthrodesis	1.1 (0.1), 0.70 (0.1), 0.97 (0.8), 0.86 (0.4)
Postsurgical spondylolisthesis Grade I and II	0.92 (0.4), 0.94 (0.8)
Location of the spondylolisthesis: L2, L3, L4, L5, S1	0.70 (0.5), 0.87 (0.3), 1 (0.8), 0.96 (0.6), 0.99 (0.9)

* Statistical significance was considered when $p \leq 0.05$.

with pain and two patients in the group without pain, and peripheral vascular disease (PVD) in seven patients in the group with pain and one patient in the group without pain. When we compared PVD in both groups, we obtained statistical significance with p=0.04 and RR=1.2. Dyslipidemia (DL) was found in five patients in the group with pain with an RR= 1.4 and hypothyroidism (HT) in two patients in the group with pain and two patients in the group without pain. Other unspecified comorbidities were found in 23 patients in the group with pain and in nine patients in the group without pain with a significant difference at p=0.001. (Figures 3 and 4)

In the group with pain, 31 patients smoked and 28 patients were alcohol-dependent, while in the group without pain 15 patients smoked and six patients were alcohol-dependent, with a significant difference in the latter, with p=0.001 and RR=1.1. (Figures 5 and 6)

Presurgical evaluation. As regards the ASA surgical risk assessment, of the patients in the group with pain two corresponded to ASA I with an RR=1.4, 43 patients were ASA II, 51 patients ASA III, and three patients were ASA IV with an RR=1.4. In the group without pain 19 patients were ASA II and 23 patients were ASA III. (Figures 7 and 8)

Regarding the Goldman scale, in the group of patients with pain 36 patients were classified as Goldman I, 55 patients as Goldman II with statistical significance between both groups with p=0.04, three patients with Goldman III, and four patients with Goldman IV and an RR=1.4. In the group without pain, 22 patients were classified as Goldman I, 20 patients as Goldman II, and two patients as Goldman III. (Figures 9 and 10)

Presurgical spondylolisthesis and segmental angulation: Segmental angulation was measured using the Cobb technique as well as vertebral displacement according to the Meyerding classification in both groups, with a mean of $4.9^{o} \pm 4.5^{\circ}$ in the group of patients with pain, of whom 27 presented grade I spondylolisthesis, 11 grade II spondylolisthesis with RR= 1.1, and one with grade III. The affected vertebral segments were located in L2 one patient, L4 eighty-six patients, L5 fifty-one patients, and S1 seven patients. In the group of patients without pain, the mean was $5.4^{o} \pm 4.9^{\circ}$,

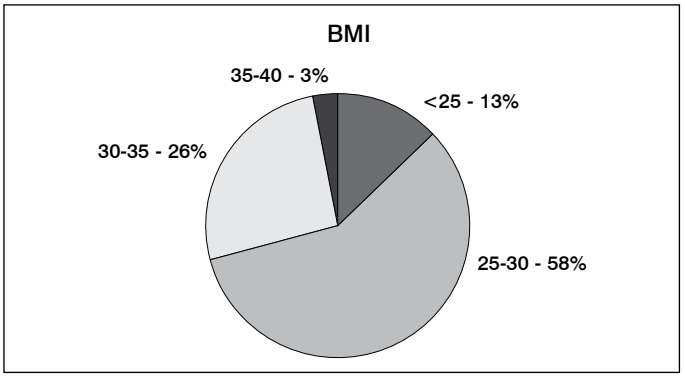

Figure 1. BMI in the group of patients with pain.

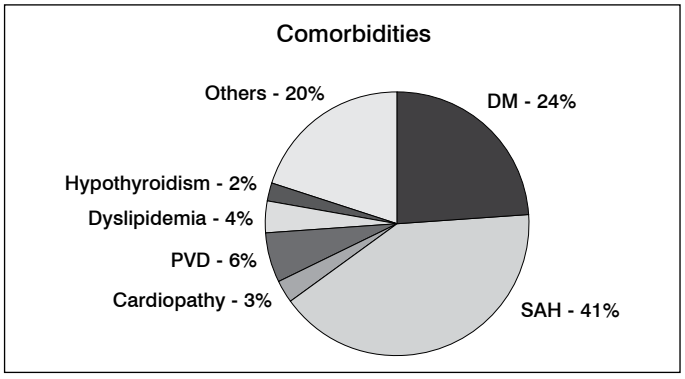

Figure 3. Comorbidities in the group of patients with pain.

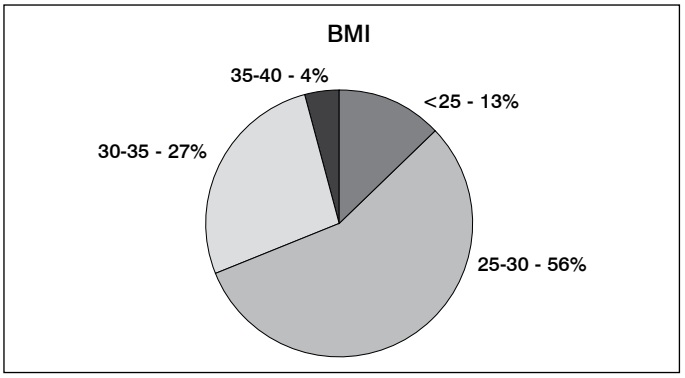

Figure 2. BMI in the group of patients without pain.

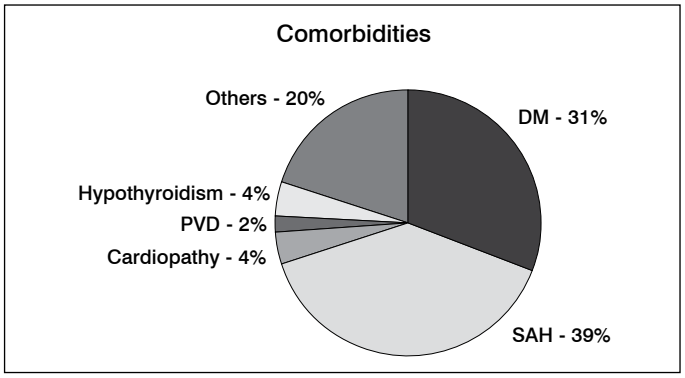

Figure 4. Comorbidities in the group of patients without pain.

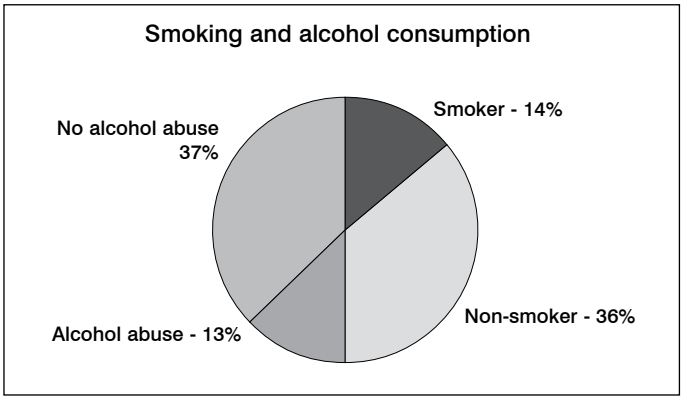

Figure 5. Smoking and alcohol abuse in the group of patients with pain.

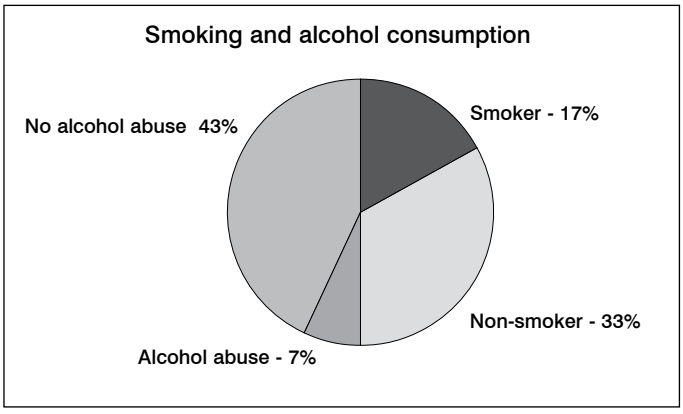

Figure 6. Smoking and alcohol abuse in the group of patients without pain.

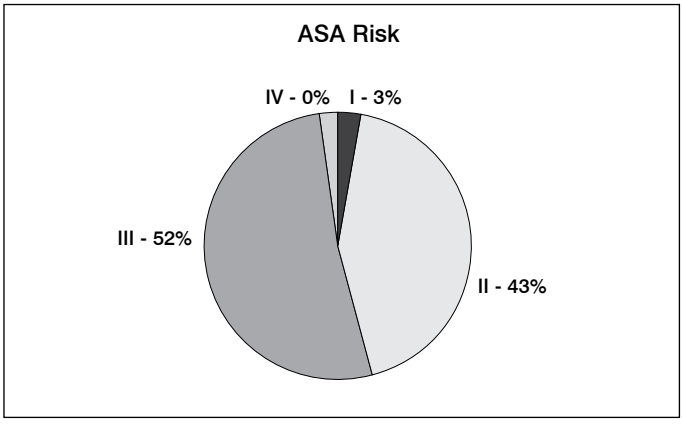

Figure 7. Presurgical ASA evaluation in the group with pain.

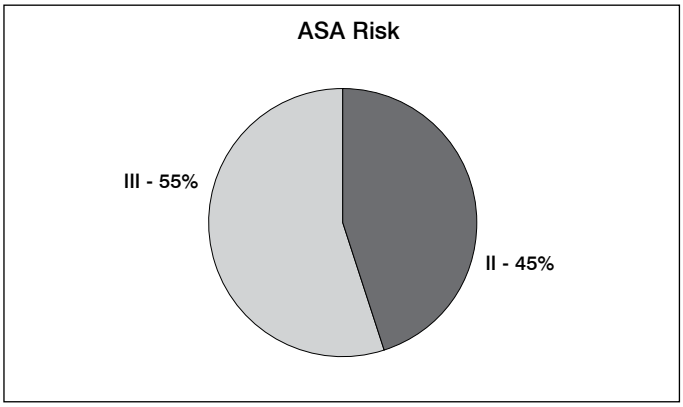

Figure 8. Presurgical ASA evaluation in the group without pain.

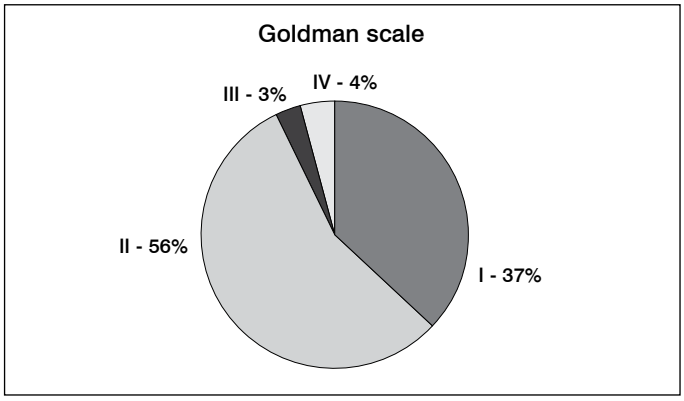

Figure 9. Presurgical Goldman evaluation in the group with pain.

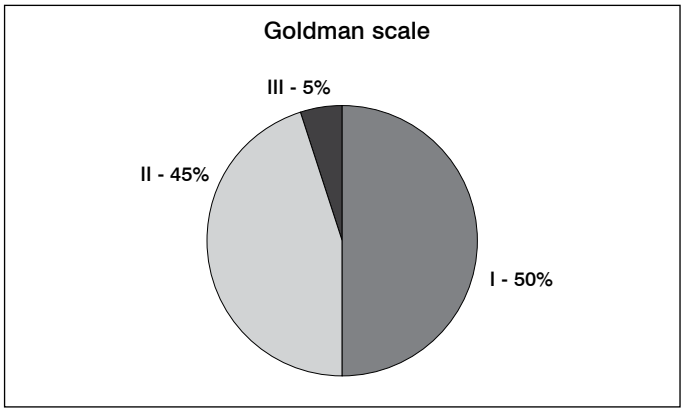

Figure 10. Presurgical Goldman evaluation in the group without pain.

16 patients with grade I spondylolisthesis, three patients with grade II, and one patient with grade III. The affected vertebral segments were located in L2 one patient with a significant difference with p=0.02, L3 eleven patients, L4 thirty-four patients, L5 in twenty four patients, and S1 three patients.

Surgical procedures. The procedures performed were simple widening in 48 patients in the group with pain and 12 in the group without pain with RR=0.8; widening with instrumentation in seven patients in the group with pain and seven in the group without pain; widening with arthrodesis in 42 patients in the group with pain and 19 patients in the group without pain; and 360° circumferential arthrodesis in 11 patients in the group with pain and seven patients in the group without pain. (Figures 11 and 12)

Postsurgical Spondylolisthesis and Segmental Angulations: Segmental angulation was measured using the Cobb technique as well as vertebral displacement according to the Meyerding classification in both groups, with a mean of $4.6^{o} \pm 4.3°$ in the group of patients with pain, of whom 28 presented grade I spondylolisthesis and four had grade II. In the group of patients without pain, the mean was $5^{o} \pm 3.9°$, 15 patients with grade I spondylolisthesis and two patients with grade II.

DISCUSSION

In spite of the data reported by Turner in 1992, where prognostic factors could not be successfully identified over the course of this disease, there are numerous studies that reveal the existence of factors that alter the course of lumbar spinal stenosis in a positive or negative direction, such as those conducted by Ciol at al. and McGregor in 2002. In our study, we observed that patients with a diagnosis of lumbar spinal stenosis had a mean age of 61.7 years, different from that reported in a study conducted by Kelsey, where it occurred between 30 and 50 years of age, a situation that could be based on delayed diagnosis and care of the patients. In our study, there was a discreet predominance of

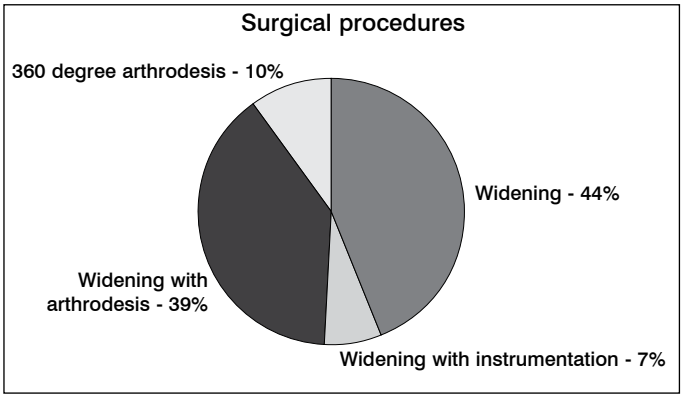

Figure 11. Surgical procedures performed in the group with pain.

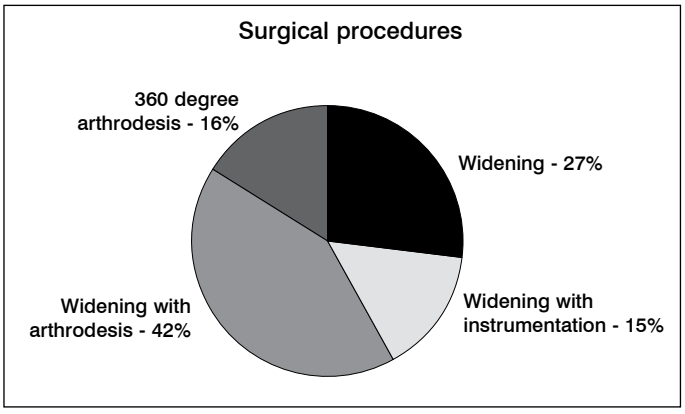

Figure 12. Surgical procedures performed in the group without pain.

males as well as a more favorable evolution for them, data that coincides with that published by Graver where they identified worse results for females.

The time of evolution of the condition is another point to consider, since in our study we reported means of 26.2 and 15.2 months in the group of patients with pain and the group of patients without pain, respectively, reiterating the delay in the care of these patients, given that, according to Porter, the global average number of months of evolution in 84% of patients prior to specific care is around three months. The mean BMI was 28.1 in the group of patients with pain and 28.8 in the patients without pain; 58% of the patients in the first group were overweight and 55% of the patients without pain were also classified within this category, contrary to that published by Aalto et al., which reported that there was no relationship between obesity and the prognosis for the pathology. However, in our study we observed a negative association between the evolution of pain and being overweight. As regards comorbidities and drug addictions, in both the group with and the group without pain, the most frequent comorbidities were diabetes mellitus II and systemic arterial hypertension, affecting 68% of the total number of patients with pain and 71% of the patients in the group without pain, data that agree with the global literature. In our study, we also found that the presence of peripheral vascular disease was a factor that correlated with the presence of pain, which we did not find reported in studies that address lumbar spinal stenosis, however, studies with larger samples to verify this result should be done.

It is worth mentioning that in our study 25% of the patients with pain and 13% of the group without pain consumed alcohol. In terms of the presence or absence of an active working life, 41% of the group of patients with pain were working and 18% of the group of patients without pain were working. We observed a significant difference when we analyzed alcohol abuse, being able to consider it as a factor that affects the presence of postoperative pain. Likewise, we found that having an active work life is considered a factor associated with the permanence of postoperative pain. Unfortunately, there are no studies that specifically highlight the importance of these factors to the course of lumbar spinal stenosis and the studies conducted to date, such as that by Aalto et al. did not find any significant association with the pain from lumbar spinal stenosis, taking into account the biopsychosocial aspects in the pathogenesis of neurogenic pain.

One possible deficiency of our study was that it failed to take other symptoms associated with the disease into account, since as reported by Niggemeyer, multiple symptoms other than pain are associated with a poor prognosis of the disease. Finally, we note the fact that most of the surgical procedures performed in our patients are those corresponding to simple widening and there is a significant correlation with improvement of low back pain. This could be due to less manipulation of the soft tissues, as well as to less bleeding and surgical time. It is worth mentioning the minimal number of 360° fusion procedures performed, for which we suggest expanding the sample size to include a greater number of patients with segmental instability and who require circumferential arthrodesis.

CONCLUSIONS

The goal of surgical treatment for lumbar spinal stenosis is the improvement and/or remission of pain, among other aspects. The former implies the persistence of pain to some degree after the postoperative period and the latter implies the absence of postoperative pain. The mean age of patients with lumbar spinal stenosis in our institution is 61 years, which may be due to three factors: the first is without doubt the increase in life expectancy, the second an improvement in the general quality of life, and the third a delay in the diagnosis for timely attention. Lumbar spinal stenosis is a discreetly more frequent pathology in males; nevertheless, men have a certain protective factor on postoperative evolution with a reduction of the risk of presenting persistent postoperative pain. The mean care time for lumbar spinal stenosis in our service is from 15 to 26 months, considering this to be the product of a saturated health care system with limited resources.

There is a negative association between the body mass index and the persistence of postoperative pain, demonstrated in both groups in the overweight category, which means that a high BMI increases the possibility of persistent postoperative pain. The pathologies commonly associated with lumbar spinal stenosis in our service are diabetes mellitus and systemic arterial hypertension, which do not present a direct correlation with the persistence of postoperative pain, but are associated with the presence of the metabolic syndrome in which obesity participates as a disease and being overweight as its precursor. This reinforces what was mentioned in the previous paragraph. Work activity and alcohol abuse are factors associated with the persistence of pain following surgery for the treatment of lumbar spinal stenosis and are possibly related to the psychosocial aspects referred to in the world literature.

Simple widening of the lumbar canal is the procedure with the lowest percentage of postoperative pain persistence, which reflects that the simple procedures manipulate the anatomical structures less and the stenosis is less severe.

There are modifiable and non-modifiable presurgical factors that influence the prognosis of patients submitted to lumbar spinal stenosis surgery. Among the modifiable factors we find alcohol abuse, body mass index, the presence of peripheral vascular disease, as well as surgical risk. The non-modifiable factors are sex and the presence of degenerative spondylolisthesis. Therefore, it is important and necessary to create a diagnostic and therapeutic guide for each of the patients who are evaluated for lumbar spinal stenosis in the spine surgery service, which should in the first instance take inherent presurgical factors such as sex, work activity, body mass index, comorbidities, and the presence or absence of various habits like alcohol abuse and smoking into account in order to obtain a better view of patients who will undergo surgical

treatment for lumbar spinal stenosis and will allow us to classify them as those who have a higher probability of poor benefits from the surgical procedure, being able to opt for other non-invasive measures such as physical therapy and rehabilitation, electrostimulation, or cognitive-behavioral therapy to manage pain, and those patients who would benefit greatly from the surgery.

It is necessary to consider patients with modifiable factors such as alcohol abuse, being overweight, or comorbidities such as peripheral vascular disease or administration of corticosteroids before indicating a surgical procedure, taking the pertinent action to achieve the control or elimination of the risk factors mentioned and increase the rate of favorable outcomes from the surgical procedure.

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REFERENCES

1. Verbiest H. A radicular syndrome from developmental narrowing of the lumbar vertebral canal. The classic. 2001; (384): 3-9.
2. Watters WC 3rd, Baisden J, Gilbert TJ, Kreiner S, Resnick DK, Bono CM, et al. Degenerative lumbar spinal stenosis: an evidence-based clinical guideline for the diagnosis and treatment of degenerative lumbar spinal stenosis. Spine J. 2008; 8(2): 305-10.
3. Benoist M. The natural history of lumbar degenerative spinal stenosis. Joint Bone Spine. 2002; 69(5): 450-7.
4. Porter RW, Hibbert C, Evans C. The natural history of root entrapment syndrome. Spine. 1984;9(4):418-21.
5. Johnsson Ke, Uden A, Rosen I. The effect of decompression on the natural course of spinal stenosis. A comparison of surgically treated and untreated patients. Spine 1991;16(6):615-9.
6. Bigos SJ, Battie. The impact of spinal disorders in industry. In: Frymoyer JW. The Adult Spine: Principles and Practice. 2nd ed. Philadelphia: Lippincott– Raven Publishers, 1997:Chap. 9.
7. Frymoyer JW, Durett CL. The economics of spinal disorders. In: Frymoyer JW, editor. The Adult Spine: Principles and Practice, 2nd ed. Philadelphia: Lippincott–Raven Publishers, 1997. 143-50.
8. Andersson GBJ. The epidemiology of spinal disorders. In: Frymoyer JW, ed. The Adult Spine: Principles and Practice, 2nd ed. Philadelphia: Lippincott–Raven, 1997:93-141.
9. Pincus T, Burton AK, Vogel S, Field AP. A systematic review of psycho- logical factors as predictors of chronicity/disability in prospective cohorts of low back pain. Spine. 2002; 27(5): E 109-20.
10. Gómez Conesa A, Méndez Carrillo FX. Génesis y mantenimiento del dolor lumbar: análisis psicológico. Revista de psicología de la Salud.1999;11(1-2):103-24.
11. Casado MIM, Moix JQ, Vidal JF. Etiología, cronificación y tratamiento del dolor lumbar. Clínica y Salud. 2008;19(3): 379-92.
12. Turner JA, Ersek M, Herron L, Deyo R. Surgery for lumbar spinal stenosis. Attempted meta- analysis of the literature. Spine 1992;17(1):1-8.
13. Herno A, Nevalainen S, Saari T. The natural course of 91 nonoperated patients with lumbar spinal stenosis. Presented at the annual meeting of the International Society for the Study of the Lumbar Spine. Burlington 1996; 25-9.
14. Johnsson KE, Rosén I, Udén A. The natural course of lumbar spinal stenosis. Clin Orthop Relat Res.1992;(279):82-6.
15. Haig A, Tong HC, Yamakawa KS, Parres C, Quint DJ, Chiodo A, et al. Predictors of pain and function with spinal stenosis, low back pain, and no back pain. Spine. 2006; 31(25): 2950-57.
16. Niggemeyer O, Strauss JM, Schulitz KP. Comparison of surgical procedures for degenerative lumbar spinal stenosis: a meta-analysis of the literature from 1975 to 1995. Eur. Spine J. 1997;6:423-9.
17. Aalto TJ, Malmivaara A, Kovacs F, Herno A, Alen M, Salmi L, et al. Preoperative predictors for postoperative clinical outcome in lumbar spinal stenosis: systematic review. Spine. 2006;31(18):E648-E63.
18. Graver V, Haaland AK, Magnaes B, Loeb M. Seven-year clinical follow-up after lumbar disc surgery: results and predictors of outcome. Br J Neurosurg. 1999;13(2):178-84.
19. McGregor AH, Hughes SP. The evaluation of the surgical management of nerve root compression in patients with low back pain: Part 1: the assessment of outcome. Spine. 2002;27(13):1465-70.