

Association of depression and functional outcomes in patients treated surgically for cervical spondylotic myelopathy through an anterior approach

Asociación de depresión y resultados funcionales en pacientes tratados quirúrgicamente por mielopatía espondilótica cervical mediante abordaje anterior

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Abstract

Objective: To determine the association of Depression with clinical outcomes in patients treated surgically for cervical spondylotic myelopathy (CSM) using an anterior approach. **Method:** An observational study was conducted in patients with ECM. The Beck scale, modified scale of the Japanese Orthopedic Association (mJOA), neck disability index (NDI) and the Visual Analogue Scale (VAS) were used preoperatively, one month and 3 months after surgery. **Results:** Initial VAS showed more severe degrees in patients with depression. At one month and third month after surgery, there was a significant decrease in pain in the group without depression ($p = 0.03$). The mJOA at one month and three months was observed that the degree of severity decreased in both groups, being more noticeable in the group without depression ($p = 0.02$). Presurgical NDI was higher in the group with depression. At three months in both groups the improvement was noticeable with respect to the degree of preoperative disability. **Conclusions:** There is a favorable relationship in patients with ECM undergoing surgical treatment in the absence of depression prior to surgery and clinical evolution, with the possibility of promoting multidisciplinary management prior to surgery in patients with depression.

Keywords: Spine. Cervical vertebrae. Depression. Cervical myelopathy.

Resumen

Objetivo: Determinar la asociación de depresión con los resultados clínicos en pacientes tratados quirúrgicamente por mielopatía espondilótica cervical (MEC) mediante abordaje anterior. **Método:** Se realizó un estudio observacional en pacientes con MEC. Se utilizaron la escala de Beck, la escala modificada de la Japanese Orthopaedic Association (mJOA), el índice de discapacidad del cuello (NDI) y la escala visual análoga (EVA) de forma prequirúrgica, al mes y 3 meses posterior a la cirugía. **Resultados:** La EVA inicial mostró mayor gravedad en los pacientes con depresión. Al mes y al tercer mes posteriores a la cirugía hay una disminución significativa del dolor en el grupo sin depresión ($p = 0.03$). En la mJOA al mes y a los 3 meses

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se observó que la gravedad disminuyó en ambos grupos, siendo más notorio en el grupo sin depresión ($p = 0.02$). El NDI prequirúrgico fue mayor en el grupo con depresión. A los 3 meses, en ambos grupos la mejoría fue notoria con respecto al grado de incapacidad preoperatorio. **Conclusiones:** Existe una relación favorable en los pacientes con MEC sometidos a tratamiento quirúrgico entre la ausencia de depresión previa a cirugía y la evolución clínica, con la posibilidad de promover un manejo multidisciplinario previo a la cirugía en los pacientes con depresión.

Palabras clave: Columna. Vértebra cervical. Depresión. Mielopatía cervical.

Introduction

Cervical spondylotic myelopathy (CSM) is a degenerative condition of the spinal cord that causes neurological deterioration secondary to the narrowing of the spinal canal due to the degeneration of the structures of the cervical spine^{1,2}. It is the primary cause of spinal dysfunction in adult population in the world^{2,3}. It cause neurological deterioration and functional decline that lead to reduced independence and lower quality of life⁴. Its exact incidence and prevalence are unknown. It affects more males than females, at a ratio of 2-7; ^{1,4,5}. The average age at the time of diagnosis is 64^{1,5}. The most commonly affected levels are C5 and C6^{1,5}. Progression tends to be slow, with a gradual decrease or a long period of inactivity. Disability is established early in the course of the disease and is followed by many years of static periods. Sensitive and sphincter changes are temporary, while motor changes tend to persist and progress with time². Patients treated with a conservative approach decline in regard to their ability to perform daily activities; on the other hand, patients who have undergone surgery show improved neurological symptoms, pain, and functional status^{1,2}.

There are several scales to assess neurological deterioration, but the most commonly used are the modified scale of the Japanese Orthopedic Association (mJOA)⁶ and the Nurick scale⁷. The neck disability index (NDI) is a tool employed to assess quality of life, specific to cervical spine conditions⁸.

Surgical treatment is the preferred method in cases of clinically evident myelopathy, but there is evidence in favor of early surgical treatment in patients with mild signs of myelopathy. The objective is an adequate decompression of the spinal cord^{9,10}.

There are different emotional and behavioral responses to the condition. Back pain is also associated with psychogenic disorders, including depression¹¹. Pain recurrence after disc surgery may be due to several demographical, social, and psychological factors, including depression, anxiety, mental state, and personality of the patient^{12,13}.

CSM, as a degenerative condition, is associated with emotional disorder, such as reactive depression, which can be a response both to chronic pain and the subsequent limitations that result from pain and movement and function limitations, such as loss of employment, social life, and friends. A significant correlation has been reported between the intensity of neck pain and depression, but there are few studies on the psychosocial factors and the outcome of surgery for the cervical disc degenerative condition¹⁴.

Currently, it is unknown whether depression treatment before surgery with any psychotherapy or antidepressants can improve results after cervical surgery. However, in studies where cognitive-behavioral therapy was provided to patients with chronic back pain there is a very significant decrease in pain intensity and disability resulting from back pain¹⁵.

The reason why this study is performed is based on the relevance of psychological evaluation of patients that are being considered for surgery due to a degenerative condition of the cervical spine, since, by being previously diagnosed and receiving psychological treatment, pain perception, functionality and disability degree will improve. The purpose of this study is to determine the association of depression symptoms with clinical and functional results in patients treated surgically for CSM by a prior approach.

Method

Observational descriptive study in patients with CSM with prior surgical approach. The protocol was submitted to research and research ethics committees, with record number R-2019-3401-016. The study was conducted between May 1 and 31, 2019.

Patients were recruited in an outpatient visits, a informational speech was given, they signed the informed consent, were given Beck depression and anxiety questionnaires, Nurick and mJOA scales, and NDI, and additionally, their pain was assessed with the Visual Analog Scale (VAS) before surgery, and at month 1 and 3 after surgery. Data was analyzed with the Student t-test.

Table 1. Demographic characterization of patients with cervical spondylotic myelopathy belonging to the clinical department and the spine department of the Orthopedics Hospital of the High Specialty Medical Unit of Traumatology, Orthopedics and Rehabilitation Dr. Victorio de la Fuente Narváez

Variables	Without depression symptoms (50%)	Without depression symptoms (50%)	p
Age in years, mean (SD)	58.9 (14.1)	59.6 (14.1)	0.20*
Gender			
Male, n (%)	11 (57.9)	11 (57.9)	0.63†
Female, n (%)	8 (42.1)	8 (42.1)	
Education			
None, n (%)	1 (5.3)	2 (10.5)	0.25†
Primary, n (%)	5 (26.3)	5 (26.3)	
Secondary (%)	7 (36.8)	4 (21.1)	
Higher middle, n (%)	6 (31.6)	5 (26.3)	
Undergraduate, n (%)	–	3 (15.8)	
Employment status			
Homemaker, n (%)	9 (47.4)	10 (52.6)	0.94†
Active, n (%)	4 (21.1)	4 (21.1)	
Unemployed, n (%)	2 (10.5)	1 (5.3)	
Retired, n (%)	4 (21.1)	4 (21.1)	

SD: standard deviation

*Student t-test.

†Ji square test.

Results

38 patients with CSM diagnosis were recruited meeting the inclusion criteria, but four were lost during the follow up, leaving a sample of 34 patients.

In the demographic characterization of our population, whether patients had depression symptoms prior to the surgery evaluated with the Beck questionnaire (Table 1) or not, we see a similar mean age for both groups (59 years old) and a predominance of males. Furthermore, we did not find statistically significant differences in the distribution by gender, education, and occupation.

In general, the majority of patients did not have any comorbidity. However, patient conditions were distributed in the following manner: in the group with depression symptoms, the majority were patients with hypertension and patients with diabetes in addition to hypertension (15.8%); and in the group without depressive symptoms, the majority did not show any type of comorbidity (68.4%), and the rest had systemic arterial hypertension (26.3%) and diabetes *mellitus* (26.3%). According to the levels of cervical affection, 10 patients (26.3%) had affection at C4-C5 level, 5 (13.1%) had affection at C5-C6 and C5-C7 level, 4 (10.1%) had affection at C3-C4 and C3-C6 level, 3 (7.8%) had affection at C4-C6 and C4-C7 level, and 1 (2.6%) with affection at C2-C3, C3-C5, C3-C7 and C6-C7

Table 2. Levels of surgical intervention in patients with cervical spondylotic myelopathy from the spinal department of the Orthopedics Hospital of the Discharge Medical Unit

Number of levels operated	n	%	p
Without depression symptoms			
1	5	27.8	0.035*
2	6	33.3	
3	5	27.8	
4	2	11.1	
Total	18	100	
Without depression symptoms			
1	4	22.2	0.035*
2	10	55.6	
3	4	22.2	
Total	18	100.0	

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Friedman Test.

level. In the majority of patients more than two cervical levels were operated (Table 2).

In regard to the basal state of the pain level evaluated with VAS, in patients with depression symptoms it was seen that the majority (n = 15) had mild to moderate pain (Table 3), while the majority of patients with depressive depression symptoms had moderate to severe pain (n = 14). In the evaluation one and three months after surgery, only four and three of the patients, respectively, showed severe pain compared to

Table 3. Association between depression symptoms (Beck) before surgery and degree of affectation before and after surgery (one and three months later) measured with VAS in patients with cervical spondylotic myelopathy operated with anterior approach.

	Without depression symptoms (n = 19) (50%)	With depression symptoms (n = 19) (50%)
	n (%)	n (%)
Presurgical VAS		
Pain level		
Mild	7 (36.8)	5 (26.3)
Moderate	8 (42.1)	9 (47.4)
Severe	4 (21.1)	5 (26.3)
Total	19 (100)	19 (100)
VAS 1 month after surgery		
Pain level		
Mild	9 (52.0)	8 (47.1)
Moderate	5 (29.4)	8 (47.1)
Severe	3 (17.6)	1 (5.9)
Total	17 (100)	17 (100)
VAS 3 months after surgery		
Pain level		
Mild	11 (64.7)	8 (47.1)
Moderate	6 (35.3)	6 (35.3)
Severe	-----	3 (17.6)
Total	17 (100)	17 (100)
p	0.03*†	0.17*†

Friedman Test.

Statistically significant by p < 0.005.

Table 4. Association between depression symptoms (Beck) before surgery and degree of affectation before and after surgery (one and three months later) measured with mJOA in patients with cervical spondylotic myelopathy operated with anterior approach.

	Without depression symptoms (n = 19) (50%)	With depression symptoms (n = 19) (50%)
	n (%)	n (%)
Presurgical mJOA		
Degree of affectation		
Mild	6 (32)	2 (11)
Moderate	7 (36)	8 (42)
Severe	6 (32)	9 (47)
Total	19 (100)	19 (100)
mJOA 1 month after surgery		
Degree of affectation		
Mild	6 (35)	3 (18)
Moderate	6 (35)	6 (35)
Severe	5 (29)	8 (47)
Total	17 (100)	17 (100)
mJOA 3 months after surgery		
Degree of affectation		
Mild	8 (47)	4 (23.5)
Moderate	7 (41)	9 (53)
Severe	2 (12)	4 (23.5)
Total	17 (100)	17 (100)
p	0.02*†	0.176*

*Friedman Test

the nine patients that had initially (preoperative VAS) manifested pain of that intensity. The most evident improvement of the pain level was seen in the group without depression symptoms ($p = 0.03$).

Regarding the preoperative evaluation of the degree of affectation evaluated with the mJOA scale, in patients without depression symptoms it was seen that six had an acute affectation, while nine of the depression symptoms group showed this degree of affectation (Table 4). However, in the evaluation one and three months after surgery it was seen that the severity decreased in both groups, with the most remarkable difference in the group without depression symptoms ($p = 0.02$).

The degree of presurgical disability was more severe in the group with depression symptoms ($n = 9$; 47%) than in the group without depression symptoms ($n = 1$; 5%). On the other hand, when evaluating the degree of disability after a month, it was seen that the number of patients with severe disability among the patients without depression symptoms ($n = 4$; 24%) increased, and the

degree of disability in the group with depression symptoms decreased ($n = 3$; 17%). At three months in both groups the improvement was noticeable with respect to the degree of preoperative disability (Table 5).

Something interesting that was observed in this study is the fact that the frequency of depression increased in groups with and without depression symptoms in the preoperative evaluation (Table 6).

Discussion

This study included a demographically homogeneous population profile, including population with averages without significant differences, as well as a homogeneous distribution for the level of education and current employment status, which allowed for a statistic without demographical bias.

González Caro, et al.¹⁵ and Groves and Muskin¹⁶ mention that psychoeducational interventions are especially useful before difficult or invasive interventions (with implication of lifestyle changes, temporary

Table 5. Association between depression symptoms (Beck) before surgery and degree of affectation before and after surgery (one and three months later) measured with NDI in patients with cervical spondylotic myelopathy operated with anterior approach.

	Without depression symptoms (n = 19) (50%)	With depression symptoms (n = 19) (50%)
	n (%)	n (%)
Presurgical NDI		
Degree of disability	-	-
With no disability	6 (32)	1 (5)
Mild	11 (58)	9 (47)
Moderate	1 (5)	9 (47)
Severe	1 (5)	-
Complete	19 (100)	19 (100)
Total	-	-
NDI 1 month after surgery		
Degree of disability	-	-
With no disability	8 (47)	7 (41)
Mild	5 (29)	6 (35)
Moderate	4 (24)	3 (17)
Severe	-	1 (6)
Complete	17 (100)	17 (100)
Total	-	-
NDI 3 months after surgery		
Degree of disability	-	-
With no disability	2 (12)	-
Mild	10 (59)	11 (65)
Moderate	4 (23)	5 (30)
Severe	1 (6)	1 (5)
Complete	-	-
Total	17 (100)	17 (100)
p	0.03**	< 0.01**

*Friedman Test

†Statistically significant by p < 0.005.

or permanent), and additionally, they point out that patients must be informed of what to expect from the procedure from a physical and emotional standpoint. Therefore, the analysis of the impact of depression symptoms on different clinical aspects and markers when they are present or not for the evolution of patients.

The VAS pain evolution was measured at two points: one month and three months after surgery, and a clear trend to a lower pain level was seen in patients who did not have depression symptoms before surgery. A clear example is the group with no initial depression symptoms, where four patients had severe pain, and one and three months after surgery no patient had severe pain. Statistically, a significant difference in the VAS evolution in favor of the group with no prior symptoms was evidenced.

Table 6. Evaluation of depression symptoms (Beck) one and 3 months after surgery in patients with cervical spondylotic myelopathy

	Without depression symptoms (n = 19) (50%)	With depression symptoms (n = 19) (50%)
	n (%)	n (%)
Depression 1 month after surgery		
Degree of disability		
Without depression	16 (94)	11 (65)
Mild	-	3 (18)
Moderate	1 (6)	1 (6)
Severe	-	2 (12)
Total	17 (100)	17 (100)
Depression 3 months after surgery		
Degree of disability		
Without depression	14 (82)	9 (53)
Mild	2 (12)	5 (30)
Moderate	1 (6)	2 (12)
Severe	-	1 (5)
Total	17 (100)	17 (100)
p	0.03**	< 0.01**

*Friedman Test

†Statistically significant by p < 0.005.

It is important to point out that chronic pain in patients had an average of 7 ± 2 months prior to surgery. 20% of patients with chronic pain still had pain, with no changes regarding perception before surgery¹⁷.

When performing an analysis of the evolution of our study group, there was a significant difference on the mJOA scale for both groups; however, when thoroughly analyzing it, we can see that in the group without depression symptoms, only 29% had a severe mJOA one month after surgery, and 11% after 3 months, contrasted with the group that had depression symptoms before surgery, in which 47% had severe mJOA one month after surgery, and 23% after 3 months, showing again that untreated prior depression plays a very important role in the evolution of the condition and response to surgical treatment. In the group with no depression symptoms, a month after surgery, 94% continued with no depression symptoms, and 82% continued with no symptoms after 3 months. In the group with prior depression symptoms, it was seen that a month after surgery 64% did not have depression diagnostic criteria, and 52% remained that way until the third month. This clearly shows the positive relationship between the absence of depression and the evolution of the disease, and surgery and depression itself, both in a favorable way.

Another score evaluated was the NDI, which determined once more a significant difference for both group, but a value of $p \leq 0.004$, which represents a confidence interval higher than 99% for the group with depression symptoms. It is recommended to continue with this line of research increasing the case study for this variable.

It is worth noting that, in our study, there were more men than women with depression symptoms, and in general, depression is more frequent in women (3:1) than in men; we believe that this may be due to the potential increase in life expectancy in men.

Conclusions

There is a favorable relationship in patients with CSM who underwent surgery between the absence of depression before surgery and clinical evolution. A door is open to promote a multidisciplinary approach for patients with that pathology and diagnosed with depression to be treated before surgery, and a greater casuistry is suggested in this regard.

A positive impact of surgery with prior approach was seen on the evolution of depression in patients with CSM.

After the analysis we adopted the true hypothesis, considering that the purpose of the study was achieved, and it was proven that patients with CSM diagnosis treated with surgery with prior approach with depression or anxiety in the preoperative period will have worse clinical and functional results after surgery than those without any alteration of their emotional state, and the majority of the patients presented a cervical nervous conduction rate that would mean a possible postsurgical recovery.

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Ethical disclosures

Protection of People and Animals. The authors state that no experiments have been conducted in humans or animals for this research.

Data Confidentiality. The authors state that the protocols of their work center regarding the publication of patient data have been followed.

Right to privacy and informed consent. The authors state that no patient information appears in this article.

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Conflicts of interest

The authors state that there are no conflicts of interest in this study.

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