ORIGINAL ARTICLE

Functional and pain evaluation in patients with spinal deformity surgically treated

Evaluación funcional y del dolor en pacientes con deformidad espinal manejados quirúrgicamente

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Abstract

Background: *The degenerative spine has an incidence greater than 60% in people over 60 years old. Functionality and pain are assessed by the Oswestry Disability Index (ODI) and the visual analog pain scale (VAPS), respectively.* **Objective:** *The objective of the study was to evaluate the functionality and pain 1 year after surgery, in patients with degenerative spine.* **Methods:** *This was a comparative, longitudinal study, in patients with degenerative spine surgically managed during 2016-2018. Functional aspects and pain were evaluated before surgery and 1 year later using ODI and VAPS. Descriptive statistics, measures of central tendency and dispersion, Student's t-test were used for the difference between the pre- and post-operative values of both scales.* **Results:** *There were 18 patients. Of these, 15 completed the follow-up; eight were men and seven women. The average age was 63.5 ± 4.8 years; 13 presented moderate post-surgical functional limitation, two intense functional limitation. There were statistically significant differences between the pre- and post-operative values for ODI and VAPS (p = 0.011 and p = 0.017, respectively).* **Conclusions:** *Functionality and pain evaluated 1 year after surgery, have a statistically significant difference compared to evaluations before surgery in patients with spine deformity surgically treated.*

Keywords: *Degenerative spine. Spinal deformity. Pain. Functional limitation. Oswestry Disability Index.*

Resumen

Antecedentes: *La columna vertebral degenerativa tiene una incidencia > 60% en los mayores de 60 años. La funcionalidad y el dolor se evalúan con el Oswestry Disability Index (ODI) y la Escala Visual Análoga (EVA), respectivamente.* **Objetivo:** *Evaluar la funcionalidad y el dolor en pacientes con columna vertebral degenerativa a 1 año de operados.* **Métodos:** *Estudio comparativo y longitudinal de pacientes con columna vertebral degenerativa manejados quirúrgicamente durante 2016-2018, a quienes se evaluaron aspectos funcionales y el dolor antes de la cirugía y 1 año después mediante ODI y EVA. Se utilizaron estadística descriptiva, medidas de tendencia central y dispersión, y prueba t de Student para la diferencia entre los valores*

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preoperatorios y posoperatorios de ambas escalas. **Resultados:** *De 18 pacientes, 15 completaron seguimiento (8 hombres y 7 mujeres). La edad promedio fue de 63.5 ± 4.8 años. Trece presentaron limitación funcional posquirúrgica moderada y dos limitación funcional intensa. Hubo diferencias estadísticamente significativas entre el preoperatorio y el posoperatorio para el ODI y la EVA (p = 0.011 y p = 0.017, respectivamente).* **Conclusiones:** *La funcionalidad y el dolor evaluados 1 año después de la cirugía tienen diferencia estadísticamente significativa en comparación con las evaluaciones antes de la cirugía.*

Palabras Clave: *Columna vertebral degenerativa. Deformidad espinal. Dolor. Limitación funcional. Oswestry disability index.*

Introduction

Adult degenerative spinal deformity is a challenging spinal disorder for the treating physician[1]. The decision between medical or surgical treatment is sometimes difficult, and lies in factors such as patient symptoms severity, risk of the intervention, and conditions inherent to the patient[2-4].

Within the described surgical techniques, long posterior fixation toward the upper thoracic region reduces the incidence of second-look surgery, but increases the complexity and bleeding amount, and prolongs surgical time[5,6]. Although surgical results are encouraging, sometimes not all patients evolve properly. The results depend on factors associated with the patient, such as body mass index, depression/anxiety status, smoking, pain severity, presence of comorbidity and deformity severity[7,8], as well as factors inherent to the surgeon that performs the procedure, such as skill and experience. Older patients, with comorbidities such as diabetes mellitus and high blood pressure, are more likely to evolve inappropriately[7,9,10]; the complication rate increases to 71% in patients older than 65 years[7].

Patients with degenerative spinal deformity usually report significant improvement at 2 years of follow-up[7].

The Oswestry Disability Index (ODI) evaluates permanent functional limitation of patients with spinal pathology and is considered the standard method for lower back functionality diagnosis. It evaluates 10 daily activities with a subjective score of functions, is self-completed and easy to apply, since it can be carried out by telephone[11]. It evaluates functionality, pain, and health limitation[12,13]. This scale, in its Latin American Spanish version, has already been used in studies in Latin America with satisfactory clinimetric results[14,15].

To assess pain, the visual analog scale for pain (VASP) is an easy, simple, and effective way to determine the degree of pain experienced by the patient at any level[7].

The purpose of this research work was to evaluate functionality and pain in patients with degenerative spine deformation 1 year after having undergone surgery.

Methods

This was a comparative, longitudinal study in patients with surgically treated spinal deformity in whom functionality and pain were evaluated before surgery and 1 year later. Patients of either gender, with degenerative spinal deformity, surgically managed, who agreed to participate in the study by filling out an informed consent document were included. Patients with cancer or with traumatic or pathological fractures of the spine and those with independent spine pathology after primary surgical care were excluded from the study, and those who failed to complete 100% of the evaluation questionnaires were eliminated. Convenience consecutive sampling was carried out and all patients who met the selection criteria cared for at Puebla Trauma and Orthopedics Hospital from 2016 to 2018 were recruited.

Functionality evaluation was carried out with ODI, version for the Mexican population, and that of pain, with the VASP, 12 months after surgery. Both scales have been widely validated and used all over the world[16]. The study variables were age, gender, diagnosis, comorbidity, trans-surgical time and bleeding, complications, and hospital stay. The type of surgery was defined according to the Schwab classification[17].

The study was approved by the corresponding ethics and research committees.

Descriptive statistics, central tendency, and dispersion measures were used to demonstrate the differences between pre-operative and post-operative evaluations, with Student's t-test, using the SPSS v. 23 statistical program for Windows.

Results

Of a total of 18 patients, three were excluded because completing ODI post-surgical evaluation was

not possible. In the remaining 15, mean age was 63.5 years (range: 53-67), with a standard deviation of 4.8 years. Patient gender, pre-operative diagnosis, and comorbidity are shown in table 1.

Mean hospital stay was 3.9 days (range: 3-8), with a standard deviation of 1.3 days.

All patients were surgically managed, with spinal instrumentation and spinal canal enlargement; clinical-radiological correlation of symptoms determined the level at which decompression was to be performed. The segment that most required spinal canal enlargement was L3-L4 by 53%. Details on surgical time, bleeding amount, and type of performed surgery (osteotomy type and number of instrumented vertebrae) are shown in table 2.

ODI and VASP scores before and after surgery had statistically significant differences (Figs. 1 and 2). In 13 of the 15 patients included in the study, there was a difference of more than 15 points between ODI pre-operative and post-operative values (p = 0.017). Pain evaluation with VASP also showed a significant improvement in post-surgical versus pre-surgical values (p = 0.011). Details are shown in table 3. The grouping of patients by time of post-surgical evolution and the differences in functionality within each group are shown in figure 3.

Among the reported complications, 3 patients (20%) had dural lesions and 1 (6.7%) had mild paresthesias on dermatomes corresponding to L1; no thromboembolic events were reported.

Discussion

Adult spinal deformity is a challenging spinal disorder associated with a wide array of clinical presentations[1]. Surgery represents a challenge, since it is complex and the results are sometimes not as expected[2,18]. The level of research in this field has not yet been able to identify which surgical procedure offers the best functional outcomes and greater pain improvement[2].

Medical management should be chosen as first-line treatment. Surgical treatment will be contemplated when medical treatment fails. The reviewed literature shows that surgical treatment results surpass those of medical treatment[19,20].

The purpose of treatment should be to reduce neural compression, correct sagittal or coronal imbalance, and fuse the spine to achieve pain relief with spinal column stability[19].

Table 1. Characteristics of the 15 patients included in the study

Gender		
Females, n (%)		**Males, n (%)**
8 (53)		7 (47)
Diagnosis		
Adult degenerative scoliosis, n (%)	**Spondylolisthesis, n (%)**	**Kyphosis, n (%)**
9 (60)	5 (33.3)	1 (6.6)
Comorbidity		
Type 2 diabetes mellitus, n (%)	**High blood pressure, n (%)**	**Heart disease, n (%)**
3 (37.5)	4 (50)	1 (6.66)

Table 2. Characteristics of the surgeries undergone by patients

Surgical time (min)			
Mean	**Minimum**	**Maximum**	**SD**
325	180	480	95
Bleeding (mL)			
Mean	**Minimum**	**Maximum**	**SD**
1940	1000	3500	841
Osteotomy technique*			
Type II: facet joints complete resection	**Type IV: pedicle/ disk/partial vertebral body subtraction**	**Instrumentation, without osteotomy**	
11	1	3	

Instrumented upper vertebrae					
T10	**T11**	**T12**	**L1**	**L2**	**L3**
1	3	2	1	6	2

SD: standard deviation; L: lumbar; T: thoracic.
*Schwab classification.

Table 3. Differences in the results of pain and functionality pre-surgical and post-surgical evaluations

Visual analog scale for pain (VASP)						
	Mean	**Minimum**	**Maximum**	**SD**	**Paired t**	**p**
Pre-surgical	8	7	9	0.65	18.89	0.011
Post-surgical	3.53	3	5	0.74		
Oswestry Disability Index (ODI)						
Pre-surgical	66.6	48	82	9.04	8.9576	0.017
Post-surgical	31.6	0	56	15.19		

SD: standard deviation.

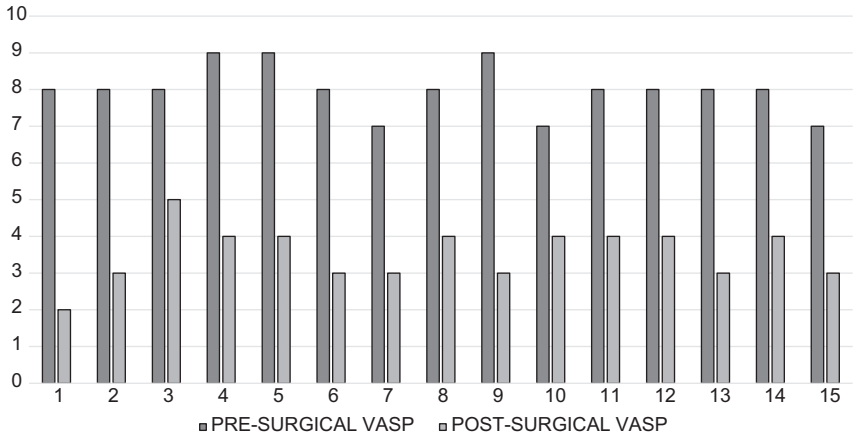

Figure 1. *Comparison of visual analogue scale for pain (VASP) scores before and after surgery.*

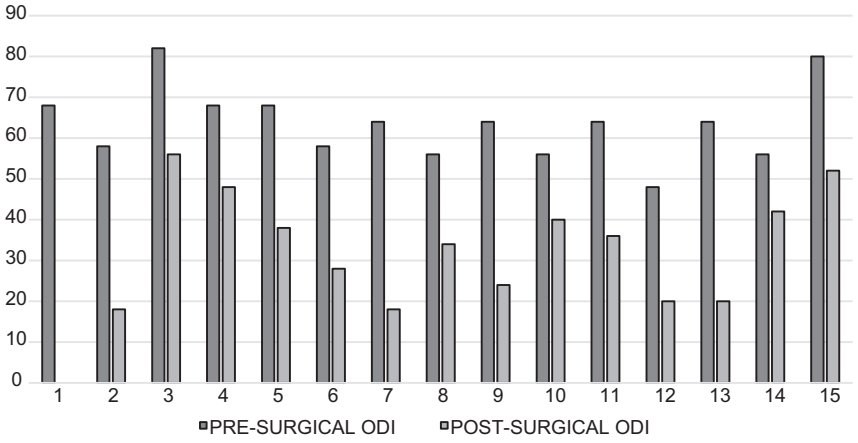

Figure 2. *Comparison of Oswestry Disability Index (ODI) scores before and after surgery. Patient 1 stands out, with a post-surgical score of 0 at 6 months of surgery.*

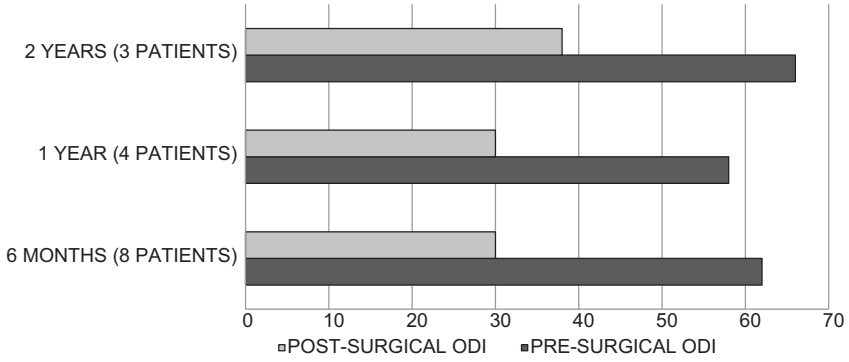

Figure 3. *Comparison of Oswestry Disability Index (ODI) scores before and after surgery, grouped by evolution time.*

The increase in life expectancy of the population has made for this pathology to be recognized as an important public health problem.

In the Mexican literature, there are no similar reports of patients with degenerative pathology of the spine, which is why it is difficult for our results to be compared

with those of other studies carried out in Mexico. The characteristics of this population are consistent with those of other studies with regard to age at presentation, gender, and functional limitation[14].

One aspect that should be considered is that data such as bleeding and surgical time are related to the surgeon's own skills and to the complexity of each patient. However, while Elgafy et al.[21] reported bleeding of 650-2839 mL, in this study, the figures are higher, since they range from 1000 to 3500 mL (mean = 1940 ± 841 mL), and our final results were highly positive.

Surgery for spinal deformity, like any spinal surgical intervention, is not without risk. The incidence of thromboembolic events has been reported to be up to 4.3%, with a high mortality rate[18]; therefore, thromboembolic events are considered to be a fatal surgical complication[20,22-24]. This complication did not occur in this study, although minor complications were reported. It should be noted that prolonged surgical time, that is, more than 8 h, increases the risk for developing complications[9]. In this work, a shorter mean time is reported (approximately 6.5 h; only in two patients, it was 8 h).

Patients with this type of disorders tend to have lower scores on functional capacity evaluation scales. Moderately disabled patients experience pain and difficulty sitting, lifting objects, and standing up. Traveling and social life are difficult, and affected individuals are unable to work. Self-care, sexual activity, and sleep are not affected, and pain is relieved with analgesics[11].

Teles et al.[22], in 2017, published disability improvement reports of 19.1 ± 9 points on ODI and Daubs et al.[23], in 2007, of 24 points. In the present study, improvement in post-surgical versus pre-surgical ODI score was 32 ±13 points, much higher than in international reference studies.

It should also be considered that the improvement of post-surgical pain compared to pre-surgical pain in these patients (VASP 4.46 ± 0.91 points) had a statistically significant difference. All this agrees with the international literature, which states that surgical treatment offers good results in patient-reported functionality and pain[7].

Yoshida et al.[24] also reported global improvement and in all domains 2 years after surgery when compared with pre-operative status, but "pain," "gait," and "standing up" were recorded to have worsened at 1 and 5 years.

Studies in the Latin American population also using ODI stand out, with reports of 56% of patients with minimal functional limitation and 6% of disability at 6 months of surgery[14,15]. Our results suggest that the functionality improvement persists over time (Fig. 3). We believe that follow-up of these patients should be continued for up to 5 years to determine the behavior of functionality and pain.

Finally, it should be remembered that, in degenerative spine pathology, surgical procedures are not curative; all cases have a certain degree of residual disability, but the purpose is to improve patient functionality and quality of life.

Conclusions

We can conclude that patients surgically managed for spinal deformity in our unit show improvement both in functionality and pain at 1 year of follow-up. We suggest for follow-up of these patients to be of 5 years to determine the results during that time.

Conflicts of interest

The authors declare that they have no conflicts of interest.

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Ethical disclosures

Protection of human and animal subjects. The authors declare that no experiments were performed on humans or animals for this research.

Confidentiality of data. The authors declare that they have followed the protocols of their work center on the publication of patient data.

Right to privacy and informed consent. The authors have obtained informed consent from the patients and/or subjects referred to in the article. This document is in the possession of the corresponding author.

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