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Evaluation of Health Related Quality of Life in Patients Candidate for Spine Surgery

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Abstract

Purpose: The aim of the present study was to assess the quality of life of patients who are candidates for spine surgery using a quality of life measure adjusted according to age and sex.

Methods: The SF-36 health questionnaire was administered consecutively to patients admitted for spine surgery. They were classified according to their clinical status: low back pain, lumbar radiculopathy, neurogenic claudication, cervical radiculopathy and cervical myelopathy. Associated morbidities were registered retrospectively using the Charlson comorbidity index. Bivariate and multivariate analyses were performed to compare the groups with each other, with the general average population and with the average population adjusted by age and sex using standardized T values.

Results: 284 patients with an average age of 49.6 years (SD=12.9) were assessed. Patients awaiting lumbar spine surgery are those who showed the worst results on both the physical and mental scales. Patients with radicular pain only showed worse results than patients with low back pain on the bodily pain scale. These results were not influenced by the associated co-morbidities.

Conclusions: The use of the SF-36 scores through standardized and age- and sex-adjusted T values provides a better appreciation of the differences between various diseases. Patients awaiting lumbar spine surgery are associated with a poorer quality of life than patients awaiting cervical spine surgery. Radicular pain in patients with lumbar pathology is only associated with a worsening on the bodily pain scale.

Keywords: Spine surgery; Quality of Life; SF-36

Abbreviations: SF-36: Short Form 36; SD: Standard Deviation; HRQOL: Health Related Quality of Life; CI: Confidences Intervals; RP: Role Physical; GH: General Health; VT: Vitality; RE: Role Emotional; MH: Mental Health; PCS: Physical Component Summary; MCS: Mental Component Summary; BP: Bodily Pain; SF: Social Function; PF: Physical Function; U.S: United States

Introduction

There has been a significant increase in spine surgery in recent years. In the United States the number of spinal surgery operations has been equated with hip arthroplasties due to an annual increase of 77% between 1996 and 2001 compared to a 14% increase in knee and hip arthroplasties during the same period [1]. More recent data shows a 137% annual increase in spinal fusions between 1998 and 2008 [2].

This increase in the demand for expensive surgical procedures is a challenge for health systems. The rationalization of resources obliges the disclosure of the outcome of medical practices. Hence, measuring methods have been developed that allow quantifying, and thus improving, the quality of our health care system [3-5]. Clinical experience shows that patients with excellent x-rays or with good articular balance are not always satisfied with their results [6]. For this reason, when evaluating the results of our treatments, it is important to take into account the subjective assessment of the patients in terms of their sense of well-being [7-9]. To this end, we have instruments to evaluate health related quality of life (HRQOL), which can be classified into two major types, specific and generic instruments. While the former are designed for use in patients with a particular type of health problem, generic instruments are irrespective of diagnosis and have been developed to be used in different types of patients or populations, highlighting the possibility of comparing the relative impact of different diseases on health, as well as obtaining population-based reference values. Within these generic questionnaires, SF-36 has been widely used, and there is a Spanish version with population-based reference values [10,11]. In standard practice, the results are measured in the form of standardized values (z values), which are the number of standard deviations from the population average. An alternative strategy to handling the results, but still little used, is to compare the results with respect to the population mean taking into account the age and sex of the individuals involved in the study [12].

The aim of this study was to compare the scores of the dimensions of the SF-36 between patients with different clinical diagnoses of spine pathology, and compare different procedures to assess the results.

Methods

Design

We used an observational, cross-sectional and analytical study.

Participants

Between January 2000 and November 2002, the Spanish version of the SF-36 health questionnaire was administered consecutively to all patients admitted for programmed lumbar or cervical spine surgery, in two hospitals within the Catalan public health network with different

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levels of expertise (level 2 and level 4), excluding repeat operations, the after-effects of trauma, and non-degenerative deformity.

Variables and instruments

Sociodemographic data regarding the patients and their pathological background of interest were registered in a standardized way, grouped according to the Charlson comorbidity index, and, following the instructions of the authors for populations with low comorbidity rate, they were distributed in two groups [13,14]. those without comorbidities and those with some comorbidity. In addition, surgical orthopaedic operations prior to the current surgery were recorded, and one point was assigned for each previous surgical operation: hip arthroplasty, knee arthroplasty, cervical spine and thoracolumbar spine surgery. As we did not have data regarding how these diseases affect the quality of life of patients in the Spanish population, it was assumed that there were no differences between the four types of surgery. The patients were classified according to their clinical picture, so that five groups were created: cervical myelopathy, cervical radiculopathy, neurogenic claudication, low back pain, and lumbar radiculopathy.

The SF-36 health questionnaire is an instrument that includes 36 items with closed response distributed in 8 dimensions or perceived HRQOL. In addition, this scale allows obtaining the sum of the physical component and the mental component of perceived health. Scores have a range from 0 (worst perceived health) to 100 (best perceived health).

Statistical analysis

A raw value for each of the subscales was obtained out of all the patients who filled in the SF-36 questionnaire, and a T value was calculated (T score = 50+10*(raw score–mean score)/standard deviation). This last value was subsequently adjusted with respect to the mean Spanish population according to age and sex [11]. A descriptive analysis of the variables was performed using measures of central tendency and dispersion for the quantitative variables and measures of absolute and relative frequency for the qualitative variables. The Shapiro-Wilk test was used to compare the normality of variables. The Student's t-test, the Mann-Whitney U test and the Kruskal-Wallis variance analysis were used to compare the quality of life averages between patient groups according to their clinical condition, comorbidities and the existence of previous orthopedic surgical interventions. The Bonferroni adjustment procedure was used to make multiple comparisons. To compare the differences of the raw T scores and the age-and-sex adjusted T scores in the variables associated with the physical and mental totals of the SF-36 questionnaire, four binary logistic regressions were employed. The dependent variables were the T scores (raw and adjusted: ≤ 30 [low HRQOL] and >30 [normal HRQOL]), and the independent variables were age, sex and type of clinical situation. The results are expressed as absolute numbers and percentages, averages, standard deviation, odd ratios and confidence intervals (CI) of 95%. In the hypotheses contrasts, a statistical significance level of 95% was considered. The data processing and analysis were conducted using the statistical program SPSS version 15.0 for Windows.

Results

The sample consisted of 284 participants, of which 88 were clinically diagnosed with cervical degenerative disc disease, 21 were diagnosed with herniated cervical disc disease, 69 were diagnosed with lumbar herniated disc, 45 were diagnosed with lumbar degenerative disc disease, 23 were diagnosed with isthmic spondylolisthesis, 17 were diagnosed with degenerative spondylolisthesis, and 21 were diagnosed with multisegmentary lumbar degenerative disc disease. Table 1 presents the participant clinical characteristics grouped according general categories. There were 109 patients with a cervical clinic situation and 175 patients with a clinical situation of lumbar origin were included, the latter being the youngest: 52.1 years (range: 29-80) and 48.1 years (range: 19-79) respectively [Mann-Whitney U = 7871,500 (p = 0.013)].

Concerning the SF-36 questionnaire, very few data were lost. Lost data in some items of the role physical subscales were detected (RP: 2.5% of participants), general health (GH: 2.1% of participants), vitality (VT: 0.7% of participants), role emotional (RE: 3.2% of participants), and mental health (MH: 0.7% of the participants), which meant that there were data missing in less than 7.5% of the cases in the physical component summary scores (PCS), and mental component summary scores (MCS).

The differences observed between the raw T values and the T values adjusted according to age and sex are significant in all cases, and are shown in Table 2 along with the effect size. The patients with lumbar pathology had a poorer quality of life ($p<0.05$) in all the subscales, both for raw and adjusted values, with the exception of the GH and MH measurements. The PCS and MCS also indicated a poorer quality of life in the patients with lumbar pathology ($p<0.05$) (Figure 1).

The patients with lumbar radiculopathy had worse scores on the subscale of bodily pain (BP) than the patients with any other studied pathology ($p<0.05$). When compared with the patients with cervical pathologies (myelopathy and cervical radiculopathy) they also had worse scores on the social function scales (SF) ($p<0.001$) and RP ($p<0.05$). Within the lumbar pathologies studied, the patients with lumbar radiculopathy and the patients with low back pain did not show any differences in the perceived quality of life in any of the SF-36 subscales, however, worse scores were detected on the subscales of VT, physical function (PF), SF and RP in comparison with patients with claudication ($p<0.05$) (Figure 2). Patients with low back pain had lower scores on the GH subscale than the myelopathy and claudication ($p<0.05$) scores, and lower scores in PF than the patients with cervical radiculopathy ($p<0.05$). The MH and RE subscale scores show no significant differences in any of the studied pathologies.

The analysis of the results of the PCS of the SF-36 showed that patients with lumbar radiculopathy had a worse perception of their physical health, these differences being significant ($p< 0.05$) for all

	Myelopathy	Cervicobrachialgia	Claudication	Low back pain	Lumbosciatalgia	Total
	(n=75)	(n=34)	(n=29)	(n=47)	(n=99)	(n=284)
Sex (male), n (%)*	52 (69.3)	19 (55.9)	16 (55.2)	15 (31.9)	51 (51.5)	153 (53.9)
Age, mean (DE)**	54.1 (10.7)	47.9 (8.8)	64.3 (8.6)	47.1 (10.5)	43.7 (13.3)	49.6 (12.9)
Comorbidities (I. Charlson), n (%)	17 (22.7)	4 (11.8)	8 (27.6)	8 (17.0)	13 (13.1)	50 (17.6)
Previous similar intervention, n (%)	6 (8.0)	6 (17.6)	5 (17.2)	7 (14.9)	7 (7.1)	31 (11.0)
*$\chi2$=16.630; df=4; p=0.002; **K-W=66.534; df=4; p< 0.001						

Table 1: Characteristics of the patients in the study

	Myelopathy (n=75)		Cervicobrachialgia (n=34)		Claudication(n=29)		Low back pain (n=47)		Lumbosciatalgia (n=99)	
SF36	*Mean*	*d*	*Mean*	*d*	*Mean*	*d*	*Mean*	*d*	*Mean*	*d*
	(CI 95%)		*(CI 95%)*		*(CI 95%)*		*(CI 95%)*		*(CI 95%)*	
Physical function	4.3 (1.7-6.8)*	0.39	4.7 (2.4-7.0)*	0.71	-5.1 (-8.0--2.1)*	-0.66	8.7 (5.4-12.1)*	0.76	14.6(11.0-18.2)*	0.81
Role physical	0.4 (-0.7-1.6)*	0.08	1.3 (-0.1-2.7)*	0.33	-4.3 (-5.8-2.8)*	-1.13	0.9 (-0.5-2.2)*	0.2	4.0(2.4-5.6)*	0.5
Bodily pain	0.4 (-0.6-1.4)*	0.09	0.6 (-0.7-2.0)*	0.16	-3.8 (-5.1-2.4)*	-1.09	-0.1(-1.5-1.3)*	-0.02	2.9(1.5-4.3)*	0.41
General health	-0.6 (1.5-0.3)*	-0.2	1.1 (-0.1-2.4)*	0.31	-4.5 (-5.8-3.2)*	-1.32	1.4(0.0-2.8)*	0.29	2.1(1.0-3.1)*	0.4
Vitality	0.1 (-0.7-0.9)*	0.03	0.6 (-0.3-1.5)*	0.23	-3.4(-4.5-2.3)*	-1.21	0.4(-0.7-1.4)*	0.11	2.1(1.1-3.1)*	0.42
Social function	1.1 (-0.4-2.6)*	0.17	2.2 (0.5-3.8)*	0.48	-3.3(-5.2-1.4)*	-0.66	2.1(0.3-3.9)*	0.34	5.9(3.8-7.9)*	0.57
Role emotional	2.2 (0.8-3.7)*	0.35	2.7 (0.6-4.8)*	0.46	-2.1(-4.5-0.3)*	-0.34	2.0(-0.1-4.0)*	0.29	3.6(1.9-5.4)*	0.42
Mental health	0.5 (-0.2-1.2)*	0.17	0.7 (-0.1-1.5)*	0.29	-1.6(-2.7-0.5)*	-0.57	-0.2(-1.1-0.7)*	-0.07	1.0(0.3-1.8)*	0.27
Physical summary	1.1 (-0.4-2.7)*	0.17	2.2 (0.3-0.4)*	0.44	-5.2(-0.7--3.3)*	-1.13	3.1(1.3-5.0)*	0.5	7.2(5.0-9.5)*	0.67
Mental summary	0.8 (0.0-1.6)*	0.24	1.0 (0.0-2.1)*	0.34	-0.6(-1.8-0.7)*	-0.19	0.1(-0.9-1.1)*	0.03	1.8(0.8-2.8)*	0.38
*p<0.001										

Table 2: Difference between the averages of the adjusted T values and the non-adjusted T values according to age and sex (average, 95% CI) stratified by pathology, and the size of the effect of the adjustment according to age and sex (d).

pathologies except low back pain. In contrast, the PCM indicated that patients suffering from lumbar radiculopathy had a worse perception of their mental health than the patients with myelopathy ($p<0.05$), and no differences were detected between the other pathologies.

The sample of this study showed low comorbidity frequency. The comorbidities detected in this study, both those included in the Charlson index and those associated with orthopedic interventions, increased in number in relation to age ($p<0.05$).

The four logistic regressions carried out (Table 3) showed differences between the results obtained with the adjusted T values and the raw T values, especially in relation to the results of the PCS. The results obtained indicate that both the age, and the type of clinical picture (cervical radiculopathy) are variables associated with the score of the PCS of the SF-36, while only the type of clinic picture (low back pain and lumbar radiculopathy) is associated with the PCM.

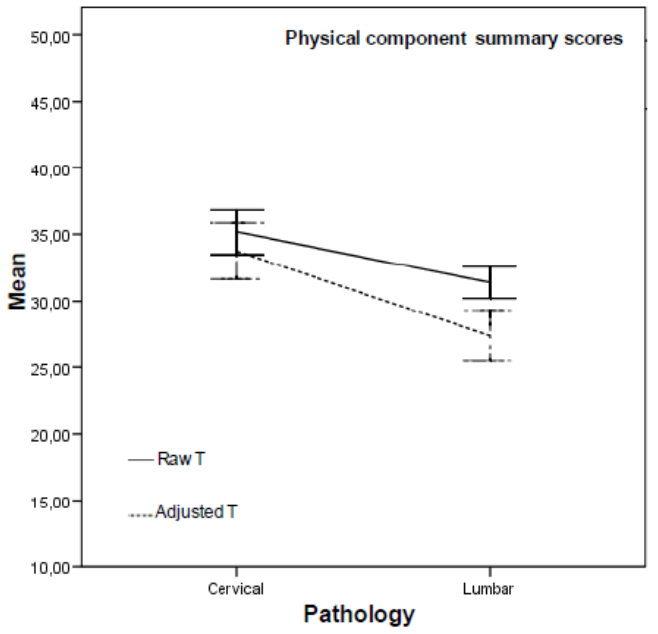
Discussion

Today, consultations regarding a spinal problem are the most frequent in traumatology. They tend to involve patients with very disabling symptoms, and in the majority of cases it is very difficult to arrive at an etiologic diagnosis. In addition, it has been seen that the symptoms are more related to the patient's feeling of being ill than to the actual pathology that causes them [3,15-19]. This is why quality of life measures have gained considerable importance when it comes to measuring our results, and within these generic scales, these measures enable us to compare the ways different pathologies affect quality of life [20-22]. Although there is some controversy regarding whether a generic questionnaire can replace a more specific questionnaire in the monitoring of a surgical procedure, the SF-36 has proven to be reliable, valid and practical, both in patients with lumbar pathology and patients with cervical pathology [23-30].

We know that HRQOL is poorer in women and gets worse with age. The SF-36 Health Questionnaire provides population values, which allows us comparing patients' results with the average for the general population. However, it does not take into account the age or sex of the people involved in the study, so we would require a large number of patients to obtain similar groups. For this reason, we compared the results of each patient with those of the Spanish population taking into account age and sex, that were published in 1998 by Alonso [10]. For this purpose, instead of working with standard deviations of population values, we have used standardized T values, which give a better idea of the differences between raw values, and values adjusted according to age and sex. Moreover, this way our results can be related to the clinical situation with no influence of other factors such as comorbidity or, as published by other authors, the age and sex of the patients [31]. We can find several references from other countries that use the SF-36 in lumbar pathology, and adjust the results according to age and sex but they do not use standardized T values [32-37]. In our series of patients, we have seen how once the results have been grouped according to age and sex, the patients with lumbar pathology show some lower scores in all the scales of the questionnaire with the exception of the MH and GH scales, in which the differences are not statistically significant even if they are worse in the patients with lumbar pathology.

The analysis of the results of the PCS, once the results had been standardized according to age and sex, shows worse physical health in patients awaiting lumbar spinal surgery. If we break down the results according to clinical groups, we can see that patients with lumbar radiculopathy are those who have the poorest quality of life, but in comparison with patients symptoms of low back pain without radicular pain, these differences are not statistically significant, except on the BP scale, which is the most sensitive scale in patients with lumbar radiculopathy as it primarily measures the intensity of the pain [38]. The absence of differences between these two clinical groups in terms of affecting their perception of quality of life goes against the contrasted fact that the pain radiating to the lower extremities causes a greater disability, even if, as published by Ren et al, the pain does not have radicular characteristics [39-42]. These differences, with respect to our study, can be explained by the fact that our patients were all awaiting surgical treatment, in contrast with the previous studies mentioned which refer to groups of individuals in outpatient monitoring. It is logical to think that the quality of life of patients with low back pain who decide to take a risk and undergo surgery must be more affected than that of patients who are following outpatient treatment. In addition, the scores of the patients with isolated low back pain are the worst on the GH scale, the scoring of which is related to the chronicity of the process, and patients with isolated low back pain are those who may take longer to be treated as, before undergoing any surgical treatment, which may have uncertain results, they often try out different types of therapy first [43].

In our study, as in Fanuele's study involving the U.S. population, no



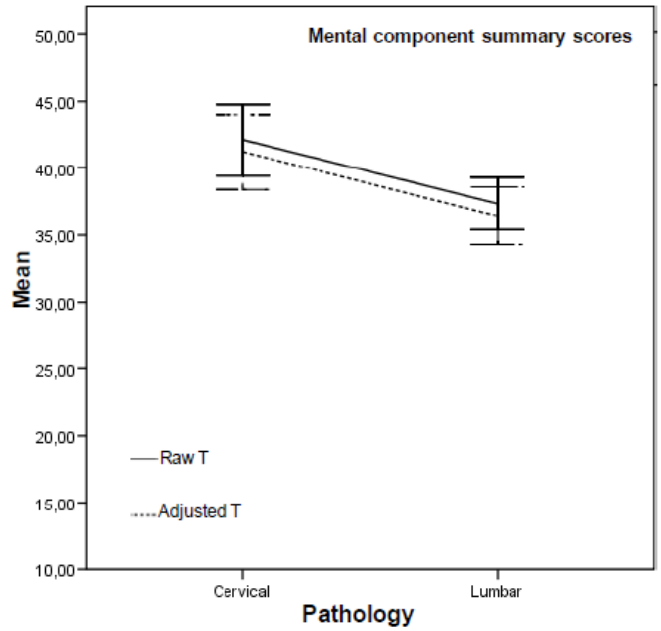


Figure 1: Raw T values and T values adjusted according to age and sex of the physical and mental summaries of the SF-36 questionnaire.

differences were observed in these two groups of pathologies in terms of the raw value of the PCS. Nevertheless, in our sample, by adjusting the results according to age and sex, we can see how statistically significant differences begin to emerge despite the quality of life of the patients with lumbar pathology [44].

When talking about the MCS we can see how the apparent differences between our patient groups are not as marked as when we talk about physical function. The only inter-group differences we have found are in patients with lumbar radiculopathy, where the scoring is worse than in patients with myelopathy.

Patients with chronic pathological processes have the ability to adapt to their physical situation, so that their mental function, in the same way as in aging, is not as affected as their physical function [45-52]. The data obtained from our patients differ from those obtained from other chronic processes. Perhaps we could find some justification for these differences in the fact that patients with a radicular situation, due to the intensity of this, and its surgical prioritization, have not had time to go through this period of adaptation, although it is true that we have no objective data that can justify it. Furthermore, patients with low back pain are frequently awaiting judicial proceedings in connection with their employment situation, which, combined with psycho-social and psychological factors, have been shown to affect the perception of low back pain, and thus the patients' mental function is likely to be more affected, regardless of the chronicity of the process [53-58]. In all events, we should not forget that in our series the SF-36 questionnaire was completed the day before surgery, which may also have had certain influence on the results obtained in terms of the stress experienced prior to any surgery.

The disadvantage of the SF-36 Health Questionnaire is that the results obtained for a concrete pathology may be altered by the existence of comorbidities in the patients involved in the study, which is much more sensitive to the influence of these in comparison with disease specific questionnaires [59]. In the population that we studied, this problem increased when analyzing clinical groups of different ages, thus one can presume that they are groups with different comorbidity index, which becomes clear when one sees that patients with lumbar pathology, who are the youngest individuals in our sample (average age 48 years old), are those who have fewer associated pathologies. In order to study the influence of the comorbidities in our results, we have chosen Charlson's comorbidity index, which, although designed to measure the risk of mortality according to the associated pathologies, and not the functional disability that they may cause in the individual, it has been proven useful in patients undergoing spinal surgery [13,60]. The multivariate analysis does not show an association between comorbidities and the results obtained in the different domains of the SF-36.

The SF-36 health questionnaire demonstrated a high sensitivity to change when we used the raw values. An avenue of future research would be to study whether this sensitivity to change is maintained when we use standardized T values adjusted according to age and sex.

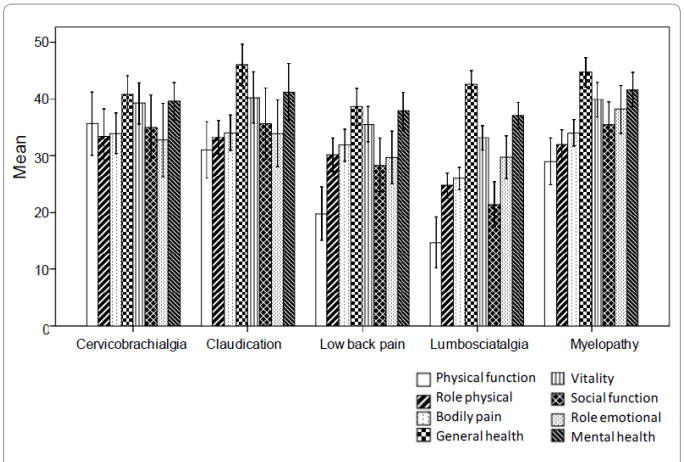


Figure 2: Mean values (T adjusted according to age and sex) of each subscale of the SF-36 questionnaire according to the pathology.

	A	Raw S F36 Mental Summary					Adjusted S F36 Men		
		Wald	df	P	OR	CI95%	Wald	df	P
SF36	Women	-	-	-	1	-	-	-	-
	Man	3.022	1	0.082	0.631	0.376-1.060	0.731	1	0.393
Age	Upto 39 years old	-	-	-	1	-	-	-	-
	Between 40 and 59 years old	0.697	1	0.404	1.329	0.682-2.591	0.224	1	0.636
	60 years old and over	0.144	1	0.704	0.844	0.352-2.025	0.923	1	0.337
Pathology	Myelopathy	-	-	-	1	-	-	-	-
	Cervicobrachialgia	0.907	1	0.341	1.534	0.636-3.699	3.606	1	0.058
	Claudication	2.485	1	0.115	2.15	0.830-5.568	3.716	1	0.054
	Low back pain	10.257	1	0.001	4.096	1.728-9.707	6.234	1	0.013
	Lumbosciatalgia	7.28	1	0.007	2.656	1.306-5.400	6.676	1	0.01

Table 3: Logistic regressions using the mental summaries (A) and physical summaries (B) adjusted and not adjusted according to age and sex as the dependent variable.

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