Evaluation of health-related quality of life in patients candidate for spine and other musculoskeletal surgery

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Abstract

Introduction Despite the high prevalence of musculoskeletal diseases, in Spain there are few data about how these conditions affect the quality of life of individuals. The objective of this study was to assess the quality of life (QOL) of patients candidate for orthopedic surgical treatment using an age–gender adjusted method of QOL scores. **Materials and methods** The SF-36 Health Survey was administered to 538 patients candidate for surgery between surgical treatment was classified in four groups (lumbar disease, cervical disease, knee arthroplasty, and hip arthroplasty). Associated morbidities were collected retrospectively for all cases using the Charlson co-morbidity index. Univariate, bivariate, and multivariate statistical analyses were done to compare the four groups to each other, to the general population mean, and to the age and gender-adjusted population mean.

Results 234 men and 304 women whose mean age was 58.78 years (19–89) were assessed. Patients candidate for some kind of lumbar surgery had the worst scores in all physical and mental scales as compared to the other disease groups. Patients candidate for knee arthroplasty, had the best quality of life scores in all scales, compared to the other disease groups. Medical conditions had no influence over the summary measures.

Conclusion Presenting the results of SF-36 in standard deviations from the age- and gender-adjusted population

mean (T values) leads to a better appreciation of the differences between the various diseases. Patients candidate for surgery of the lumbar spine had a worse QOL, while the QOL in patients candidate for knee arthroplasty was the least affected.

Keywords Quality of life · SF-36 · Outcome assessment · Spinal diseases · Osteoarthritis

Introduction

In Spain, musculoskeletal diseases have a high prevalence. About 10 million people are estimated to visit a doctor each year for a problem of this kind [10], which is also a major cause of temporary work disability [50]. In the Western world, physician visits for these conditions exceed all other visits. Despite this high prevalence, in Spain, there are practically no data about how these conditions affect the quality of life (QOL) of individuals. Only Carmona [10] showed, in 2001, that musculoskeletal conditions (rheumatoid arthritis, osteoarthritis, lumbar pain, and fibromyalgia) have an effect on physical functioning in a way that affects the quality of life of patients, as compared to the “healthy” population. Within these musculoskeletal diseases, lumbar pain is the main and most costly problem in the age group of 20–50 years [32, 46], and degenerative disease of the hip and the knee occupy this place in the over 60 years of age group [3]. Worldwide, more than one million hip prostheses are implanted each year, and figures for knee arthroplasty are rapidly approaching that level [38]. Surgery of the spine has experienced an important increase over the last few years [49, 51].

In the United States, the number of surgical interventions of the spine has equaled the number of hip

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arthroplasties due to a 77 % yearly increase between 1996 and 2001, as compared to a 14 % increase in knee and hip arthroplasties during that period [16]. This increased demand for costly surgical procedures represents a challenge for any healthcare system. In 1996, 48 % of all patients on waiting lists in Catalonia were for the specialties of Ophthalmology and Orthopedic Surgery; in the latter case, most were candidate for knee or hip prosthetic surgery. The rationalization of resources force us to know what the outcomes of medical actions are. For this reason, measurement methods have been developed to quantify and thus improve the quality of our healthcare services [6–8], where the patients' subjective perception of well-being after completing the treatment is increasingly important [17].

Clinical experience has shown that patients with excellent X-rays or with a good joint balance are not necessarily satisfied with their outcomes. The X-rays or the range of movement of a given joint may signal the long-term outcome of a given treatment, but they do not provide an idea of the subjective effect on the patient's sense of well-being. Owing to the physical, social, and emotional harm that can result from a given treatment, the assessment of our outcomes must take into consideration the general health of patients, their ability to work, their expectations, and their perception of pain [30]. This is the reason why health status measurement instruments must be added to traditional measurements, and should be specific for a given disease, as well as generic, to measure quantitative and qualitative aspects of QOL, with no reference to a disease or problem affecting the patient's health. Thus, these measurement instruments can tell us how a specific disease affects the health status [24], or the patient's perception of health, and how a given treatment affects such health status [24, 36]. One of the advantages of generic instruments is the ability to compare the relative impact of various diseases on health, and being able to obtain reference values for the population. SF-36 is one of the most widely used generic questionnaires; it correlates well with other specific scales [25], and has good sensitivity to change [18, 37, 48]. It is used by most American Patient Outcome Research Teams (PORTs), which constitute one of the most important research initiatives for evaluating healthcare services [13, 54, 55]. In the Spanish version of SF-36 [1], there are data for reference standards for the general population as well as for each age- and gender group [2, 20]; this permits the comparison of the results to the population values. In ordinary practice, the results are measured as "z" values, which are the number of standard deviations from the population mean. A newer way to manage outcomes, which is not yet widely used, is to compare the results to the population mean, taking in consideration the age and gender of the subjects studied; this allows to see selection

biases, and to work with individuals of different ages and genders.

The objective of this study was to compare the QOL of patients candidate for surgery of the spine or for total knee or hip arthroplasty using an age–gender adjusted method of QOL scores.

Materials and methods

Design

Cross-sectional and observational study.

Participants

Consecutive sample of patients diagnosed with a degenerative disease of the cervical or lumbar spine, degenerative disease of the knee or degenerative disease of the hip. All the cases were admitted in two hospitals of the Catalan healthcare network (levels 1 and 3 of expertise) between January 2000 and November 2002 and where scheduled for surgery of the spine or for total knee or hip arthroplasty.

Instruments and procedure

The Spanish version of the SF-36 Health Survey [1] was administered. The SF-36 was administered on the day before surgery by a nurse whose function was to deliver and collect the questionnaire, and to answer any questions that may arise while filling it. Subsequently, the relevant medical history was collected, which allowed us to know which co-morbidities could somehow affect the results yielded by a questionnaire that measures the subjective perception of general health. These data were grouped according to the Charlson co-morbidity index [11]. According to author's instructions [43] for samples with a low co-morbidity index, we divided the patients in two groups: without co-morbidities and patients with a co-morbidity. In addition, we recorded the number of past orthopedic surgical interventions prior to the current intervention, which could somehow affect the patient's perception of health; one point was assigned to each intervention performed: knee arthroplasty, hip arthroplasty, cervical spine or thoracolumbar spine surgery. Because there were no previous data available about how these diseases affected the quality of life of Spanish patients, it was assumed that there were no differences in what influences these conditions might have. Patients were grouped according to their pathological condition: degenerative knee disease, degenerative hip disease, lumbar spine disease, and cervical spine disease.

Statistical analysis

Based on all the questionnaires filled by the patients, we obtained a raw value for each of the SF-36 scales, ranging from 0 to 100 (100 being the best possible score), and a “*T*” value that associated the absolute value of each scale to the Spanish population mean according to age and gender. Because reference values are already available for the Spanish population [20], we also obtained values “*T*” for the physical (PCS) and mental (MCS) component summary scores.

A descriptive analysis was performed on study variables using central tendency and dispersion measures for quantitative variables and relative and absolute frequencies for qualitative variables. We used the bivariate *t* Student test, the Mann–Whitney *U* test, and the analysis of variance (ANOVA) to compare the means of QOL between groups of patients according their pathological condition, their comorbidity, and their orthopedic morbidity. We used the Bonferroni’s adjustment for multiple comparisons. To assess the effect of pathological condition, of comorbidity and the orthopedic morbidity in QOL, we used multiple linear regression models. For the first equation, the *T* value (age- and gender-adjusted) of the PCS scores was used as dependent variable. The predictive variables were pathological condition, comorbidity, and orthopedic morbidity. In the second equation, the independent variables were maintained, and the dependent variable analyzed was the *T* value of the MCS scores.

The results are expressed as absolute numbers and percentages, means, standard deviation, and 95 % CI. When contrasting hypotheses, a statistical significance of 0.05 was used. Data processing and analysis was performed using the SPSS statistical program version 14.0 for Windows.

Results

A total of 538 patients were included in the study. The mean age was 58.7 years (SD 14.8; range 19–89) and 56.5 % (*n* = 304) were women, and men were younger than women (55.3 vs. 61.4; *t* test = 4.7; *df* = 536; *p* > 0.001). 167 (31.0 %) patients were admitted for surgery for gonarthrosis, 87 (16.2 %) for coxarthrosis, 109 (20.3 %) for cervical disease, and 175 (32.5 %) for lumbar disease. The etiologic diagnoses were 167 osteoarthritis of knee, 87 osteoarthritis of hip, 88 cervical degenerative disc disease, 21 cervical disc herniation, 69 lumbar disc herniation, 23 isthmic spondylolisthesis, 17 degenerative spondylolisthesis, 45 lumbar degenerative disc disease and 21 multilevel lumbar degenerative disc disease. According to the Charlson index 125 participants (23.2 %) had one or more comorbidities, and 89 (16.5 %) participants have

previous history of orthopedic surgical interventions. Table 1 are summarized the clinical and demographic characteristics of the participants according to the orthopaedic procedure. There were statistically significant differences in all clinical and demographic characteristics depending on the orthopaedic procedure group, age (*F* = 142.4; *df* = 3; *p* > 0.001), sex (χ^2 test = 49.9; *df* = 3; *p* > 0.001), Charlson groups (χ^2 test = 16.1; *df* = 3; *p* = 0.001) and previous history of orthopedic surgical intervention (χ^2 test = 14.2; *df* = 3; *p* = 0.003).

We did not obtain the same number of patients that filled the various scales of the questionnaire; thus, the only scale that did not have any lost values was the bodily pain (BP) scale. Minimum (0) and maximum (100) scores were obtained in the eight SF-36 scales. The values obtained in the eight scales, and the physical and mental component summary scores are shown in Table 2.

All patients in our study had a worse score than the general Spanish population in a statistically significant manner (*p* < 0.0001), regardless of their disease. When the results were adjusted for age and gender, these differences were maintained in all the scales (*p* < 0.0001), except for the general health scale for patients candidate for arthroplasty.

The comparison of absolute and *t* scores of each SF-36 summary according the orthopaedic procedure showed some differences.

The absolute values of the PCS were better inpatients awaiting surgery cervical regarding patients awaiting hip arthroplasty (*p* < 0.05). However, when we adjusted for age and sex values are the patients with lumbar pathology which showed poorer results (*T* score = 2.2609; *F* = 37.4; *df* = 3; *p* > 0.001) than that of patients candidate for any of the other orthopedic procedures. Also, patients candidate for knee arthroplasty (*T* score = 1.0540; *F* = 14.2; *df* = 3;

Table 1 Clinical and demographic characteristics of participants according orthopaedic procedure

	Hip	Knee	Cervical	Lumbar
Age [mean (SD)]	66.0 (12.7)	70.6 (5.9)	52.1 (10.4)	48.0 (14.0)
Sex [<i>n</i> (%)]				
Male	42 (48.3)	39 (23.4)	71 (65.1)	82 (46.9)
Female	45 (51.7)	128 (76.6)	38 (34.9)	93 (53.1)
Charlson groups [<i>n</i> (%)]				
Charlson score = 0	54 (62.1)	125 (74.9)	88 (80.7)	146 (83.4)
Charlson score ≥ 1	33 (37.9)	42 (25.1)	21 (19.3)	29 (16.6)
Orthopedic morbidity [<i>n</i> (%)]				
No	69 (79.3)	127 (76.0)	97 (89.0)	156 (89.1)
Yes	18 (20.7)	40 (24.0)	12 (11.0)	19 (10.9)

Table 2 Absolute and *T* score of SF-36 scales according orthopaedic procedure

	Hip	Knee	Cervical	Lumbar
BP				
Absolute score ^a	22.6	28.0	35.4	23.5
<i>T</i> score ^a	−1.7	−1.2	−1.6	−2.1
GH				
Absolute score	55.3	51.3	53.6	52.9
<i>T</i> score ^a	−0.1	−0.0	−0.7	−0.8
MH				
Absolute score	56.9	55.9	55.7	50.0
<i>T</i> score ^a	−0.7	−0.5	−0.9	−1.2
PF				
Absolute score	22.8	23.6	50.0	34.1
<i>T</i> score ^a	−2.0	−1.4	−1.9	−3.1
RE				
Absolute score	45.2	46.8	53.7	37.3
<i>T</i> score ^a	−1.1	−0.8	−1.4	−1.9
RP				
Absolute score ^a	20.2	29.0	23.8	10.8
<i>T</i> score ^a	−1.4	−0.9	−1.8	−2.2
SF				
Absolute score ^a	60.1	56.6	63.2	48.1
<i>T</i> score ^a	−1.2	−0.9	−1.5	−2.4
VT				
Absolute score ^a	42.5	45.7	50.0	35.5
<i>T</i> score ^a	−0.8	−0.4	−1.1	−1.5
MCS				
Absolute score ^a	43.5	42.4	42.1	37.4
<i>T</i> score ^a	−0.6	−0.5	−0.9	−1.4
PCS				
Absolute score ^a	29.6	30.3	35.3	31.5
<i>T</i> score ^a	−1.5	−1.1	−1.6	−2.3

BP bodily pain, GH general health, MH mental health, PF physical functioning, RE role emotional, RP role physical, SF social functioning, VT vitality, MCS mental component summary, PCS physical component summary

^a Differences between orthopaedic procedure groups (Bonferroni's adjustment for multiple comparisons)

$p < 0.001$) experience a lesser effect on their QOL than those in the three other disease groups. With regard to MCS, patients are awaiting surgery lumbar those with greater impairment of their QOL regardless of we adjust the results by age and sex ($p < 0.05$).

The patients in our study had increased diseases associated with older age, and this increase was statistically significant for associated orthopedic diseases, which we've denominated orthopedic morbidity ($p = 0.001$), as well as for the co-morbidities included in the Charlson index ($p = 0.000$) and the groups resulting from that index

($p = 0.000$). Despite this fact, our study population has a low number of co-morbidities.

We found no statistically significant influence of co-morbidities on *T* values of the various scales or summaries (Table 3). The multivariate analysis of the MCS and PCS indicated that only type of orthopaedic procedure was related to the scores. Neither the Charlson group, nor the orthopedic morbidity was related to the summary scores of the subscales.

Discussion

As in other studies with a United States population, there is no difference for the absolute values of PCS among the four groups of pathology. In any case, when we adjust the results for age and gender (an adjustment not made in previous studies), statistically significant differences in quality of life begin to emerge in patients with lumbar disease as compared to the other groups [4, 19, 28, 35, 42].

In the PF scale, the most important factor for the absolute results is age, which explains that if the results are not adjusted for age, older patients have worse scores, and the effect on quality of life may be overrated in these patients or the outcome of a specific surgical treatment underrated [41]. Thus, patients with the worse absolute scores are those with knee and hip disease, who have the highest mean age. However, when we compare our results to a population of the same age and gender, we can see that the younger population in the study consisting of individuals with lumbar disease and have worse scores for specific physical activities. This is one of the scales where the need to standardize results for age and sex becomes more evident (Table 4).

For the MCS, the differences between our patient groups are not as marked as for physical function. However, differences with respect to the population mean are statistically significant for all four groups. This fact contradicts the known information that patients with chronic disease processes are able to adapt to their physical situation so that their mental function is not as affected as their physical function [44, 45]. Although we have no objective data to support this, these differences may be partly explained by the fact that, for instance, patients with radicular symptomology within the lumbar and cervical disease groups—due to the intensity of their symptoms—and patients candidate for arthroplasty—due to their prioritization in waiting lists—may have not had time to go through this adaptation period. On the other hand, patients with lumbalgia, as we have seen, are more often awaiting legal actions associated with their job situation; this may have a greater effect on their mental functioning, irrespective of the chronicity of the process [5, 9, 22, 33, 47, 52].

Table 3 Absolute and *T* score of SF-36 scales according to Charlson group and orthopaedic morbidity

	Charlson group			Orthopaedic morbidity		
	Score = 0	Score ≥ 1	<i>p</i>	No	Yes	<i>p</i>
BP						
Absolute score	27.6 (23.8)	25.9 (21.6)	0.524	28.9 (23.9)	21.7 (19.4)	0.022
<i>T</i> score	−1.7 (1.2)	−1.5 (0.8)	0.197	−1.6 (1.0)	−1.6 (0.8)	0.658
GH						
Absolute score	53.5 (20.9)	51.2 (20.2)	0.196	54.6 (20.3)	44.6 (21.3)	0.000
<i>T</i> score	−0.4 (1.1)	−0.3 (1.0)	0.415	−0.4 (1.1)	−0.6 (1.1)	0.058
MH						
Absolute score	53.0 (22.5)	57.0 (23.9)	0.076	54.4 (22.2)	52.0 (25.8)	0.370
<i>T</i> score	−0.9 (1.1)	−0.7 (1.2)	0.033	−0.8 (1.1)	−0.8 (1.3)	0.884
PF						
Absolute score	33.0 (24.1)	29.8 (25.1)	0.103	33.6 (24.8)	25.3 (20.5)	0.005
<i>T</i> score	−2.3 (1.7)	−1.8 (1.4)	0.007	−2.2 (1.7)	−2.0 (1.5)	0.720
RE						
Absolute score	44.2 (42.6)	46.9 (44.6)	0.655	45.7 (43.2)	40.3 (42.2)	0.257
<i>T</i> score	−1.4 (1.6)	−1.2 (1.6)	0.192	−1.4 (1.6)	−1.3 (1.4)	0.851
RP						
Absolute score	20.5 (34.3)	21.3 (33.9)	0.826	20.4 (34.1)	21.9 (34.9)	0.693
<i>T</i> score	−1.6 (1.2)	−1.4 (1.0)	0.003	−1.6 (1.2)	−1.3 (1.0)	0.019
SF						
Absolute score	54.6 (30.0)	59.4 (30.1)	0.114	56.1 (30.0)	53.7 (30.3)	0.403
<i>T</i> score	−1.7 (1.7)	−1.2 (1.5)	0.004	−1.6 (1.7)	−1.4 (1.5)	0.456
VT						
Absolute score	40.9 (23.0)	43.5 (23.5)	0.193	42.2 (23.3)	38.1 (22.6)	0.139
<i>T</i> score	−1.0 (1.2)	−0.7 (1.1)	0.013	−1.0 (1.2)	−0.9 (1.1)	0.937
MCS						
Absolute score	40.3 (12.8)	43.0 (12.8)	0.046	41.0 (12.7)	40.0 (13.5)	0.479
<i>T</i> score	−0.9 (1.3)	−0.6 (1.3)	0.053	−0.9 (1.3)	−0.8 (1.3)	0.961
PCS						
Absolute score	31.9 (7.7)	30.7 (8.6)	0.071	32.0 (7.0)	29.4 (7.3)	0.003
<i>T</i> score	−1.7 (1.2)	−1.5 (1.0)	0.063	−1.7 (1.1)	−1.6 (1.0)	0.632

BP bodily pain, *GH* general health, *MH* mental health, *PF* physical functioning, *RE* role emotional, *RP* role physical, *SF* social functioning, *VT* vitality, *MCS* mental component summary, *PCS* physical component summary
Bonferroni's correction: $p < 0.0025$

Table 4 Multivariate analysis of the variables related to the physical and mental components

	T-MCS		T-PCS	
	Standardized β	<i>p</i>	Standardized β	<i>p</i>
Charlson group	0.073	0.094	0.060	0.149
Orthopaedic morbidity	−0.041	0.356	−0.047	0.263
Pathology	−0.271	0.001	−0.422	0.001
<i>MCS</i> mental component summary, <i>PCS</i> physical component summary				

The health questionnaire was given on the day before surgery, once the patient had been admitted to the hospital. This may mask the fact that not all patients were on the waiting list for the same length of time, and that the lists

could be different in the two hospitals participating in the study. However, Kelly et al. [31], and Nilsson and Lohmander [40], noted that the waiting time did not affect function and pain in patients on a waiting list for hip or knee arthroplasty, and that the changes that occurred were not necessarily for the worse, but there could also be improvements in the QOL. The results obtained by these two authors do not completely agree with those of Derret et al. [14] in 1999, who observed three groups of patients on a waiting list for three different surgical procedures (prostatectomy, total knee arthroplasty, and total hip arthroplasty); although the symptomology did not worsen, the SF and the RE scales measured by the SF-36 questionnaire did. In our case, we believe that by giving the questionnaire on the day before surgery suppresses the effect on QOL of being immersed in a surgical waiting list. On the other hand, when patients fill health questionnaires

in the pre-operative stage, it is more likely that they will attribute their health status to that process, cancelling the effect of other co-morbidities they may have; this is one of the problems attributed to generic questionnaires when used in specific disease [29]. To analyze the effect of co-morbidities on patients in our study, we have selected the Charlson co-morbidity index [11], which measures mainly the risk of death, not the functional disability that the co-morbidities may cause in the individual [23]. However, in 1992 Deyo et al. [15] showed the usefulness of this index in patients undergoing spine surgery, and in 1993, Greenfield et al. [27] did the same with patients undergoing hip arthroplasty. The analysis of the results based on the Charlson co-morbidity index shows that patients without co-morbidities have worse *T* scores, but these differences are not statistically significant. These results suggest that co-morbidities in our study are not associated with a worse perception of QOL as measured by the SF-36 health questionnaire.

A problem with this study is that the sample is not homogeneous in terms of age and gender for the various groups. This fact is even more important when QOL is studied, since it is a known fact that this is worse in women and as age increases. On the other hand, some studies [34] have observed how the results from one group of patients undergoing hip arthroplasty and assessed with the SF-36 are very influenced by the patients' age and gender. The SF-36 provides population values that permit the comparison of results of patients to the mean of the general population, a value that does not take into consideration the age or gender of the subjects studied [2]. This is the reason why we compared the results of each patient to the Spanish population of their age and gender [2]. This perspective allows us to see that the results are the product of the disease motivating the patient's admission, without influence of other factors such as co-morbidity and orthopedic morbidity, or, as expected from the preceding publications [26], age. There are several references about populations of other countries that use the SF-36 in the same way in patients with lumbar disease, i.e., standardizing by age and gender [12, 35, 39, 53]; this is not so in Spain, where our study is the first to compare these four groups of diseases using the *T* scores of the SF-36.

One of the drawbacks of the study design is that results cannot be generalized, although the fact that patients correspond to two different specialized hospitals (levels 1 and 3) can give some external validity.

The data from the present study show that a group of patients such as those with lumbar disease, who are younger and therefore potentially productive from the labor point of view, have a worse perception of quality of life in all the scales in a general health questionnaire such as SF-36. The question raised, then, is whether the data

available justify prioritizing surgical treatment for this group of patients above surgical treatments that have shown clinical efficacy not only in the short, but also in the long term, such as hip and knee arthroplasty. For this purpose, we may have to develop different clinical groups of lumbar disease, for lumbalgia is not the same as lumbar sciatic pain; we must also avoid objective measure data such as the rate of lumbar fusion in lumbar arthrodesis, which is not always associated with better clinical outcomes [21].

Conclusions

1. The SF-36 questionnaire is useful for comparing health-related QOL between patients with various musculoskeletal diseases.
2. Presenting the results as *T* scores leads to a better appreciation of the differences between the various diseases.
3. Presenting the results as *T* scores patients with lumbar diseases have worse scores in the SF-36 questionnaire in all the evaluated scales, both physical and mental.
4. Patients with knee diseases waiting arthroplasty have a lesser alteration in their QOL as compared to other study groups.

Conflict of interest None.

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