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Gender Differences in the Self-assessment of Quality of Life and Disability After Spinal Fusion for Chronic Low Back Pain at a Neurosurgical Center in Eastern Europe

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Objective: Mechanical alterations of the spine, which can cause chronic low back pain (LBP), are a frequent indication for spinal fusion. Studies have shown differences between genders in patients' evaluations of health-related quality of life (HRQoL) after spinal procedures, but results have been conflicting, and some authors have suggested that cultural variation could explain these discrepancies. The objectives of this study were to determine the influence that gender plays on HRQoL, disability, and the correlation between the 2 in people undergoing spinal fusion for chronic LBP at a neurosurgical centre in Eastern Europe.
Methods: Patients undergoing fusion surgery at a single centre for LBP with a duration of more than 3 months were included. They were evaluated using the Short Form Health Survey version-2.0 (SF-36v2) and Oswestry Low Back Pain Disability Index (ODI) questionnaire preoperatively and 1 year after the surgical procedure to identify differences between genders and to evaluate correlations between disability and quality of life.
Results: We included 31 female and 30 male patients. The male patients had higher disability scores at the preoperative evaluation, but improved more than females in all domains of disability at the postoperative evaluation. HRQoL improved similarly in both genders. The ODI score showed a strong or moderate correlation with 6 of the domains of the SF-36 in males, but with only 3 domains in females. Surgery had a positive impact on the mental status of more men than women at risk of depression.
Conclusion: The type of benefit that surgery offers seems to be influenced by gender. While HRQoL improved in both genders, disability decreased significantly more in male patients. Male patients also showed a closer correlation between HRQoL and disability. We conclude that men and women place different importance on specific aspects of their overall quality of life.

Keywords: Low back pain, Spinal fusion, Quality of life, Spinal diseases

INTRODUCTION

Low back pain (LBP) ranks as the second cause for people seeking health care and as the most frequent cause of activity limitation in patients under the age of 45 years.[1,2] Mechanical alterations as disc herniation, spondylolisthesis, degenerative disc disease, and lumbar stenosis are the most frequent causes of pain.[3] Chronic LBP (CLBP) is usually regarded as pain persisting for more than three months. Although evidence suggests that indications for performing fusion procedures in LBP vary from region to region, advances in technology have made the rates of this type of spine surgeries increase in the last decades.[1]

These factors determined the need for delivering evidence-based approaches to spine fusion surgery.[4]

As the patient's view may differ from those of their clinicians, the success of various therapies shifted from earlier reliance on clinicians impression to that of the patient.[5] Assessment of patient reported outcomes (PROs) is done by using health-related quality of life (HRQoL) and disease-specific questionnaires. These types of questionnaires are complementary to each other. Therefore it is essential to see how the results of the 2 measures correlate.[1] Research suggests that gender influences PROs after certain types of surgical treatment.[6,7] This influence is unclear in spinal procedures as studies report different results and at least 2 recent studies that included patients for which spinal fusion was performed, reported conflicting results regarding the influence of gender.[8,9] Various authors also suggested that the impact of gender on PROs could be different in various geographical and cultural settings, and this disparity should be taken into account.[10,11] That makes it critically important to have data coming from distinct regions and cultural settings when looking at the relationship between gender and PROs. Until now, there is a lack of studies coming from Eastern Europe looking at PROs after spine surgery. The primary objective of our study was to determine if gender influenced self-reported changes in HRQoL and disability in patients with CLBP for which instrumented surgery was performed and to identify how HRQoL and disability correlate in male and female patients in a neurosurgical located in Eastern Europe. Another purpose was to determine if the surgical procedure influenced the risk of depression differently in women and men.

MATERIALS AND METHODS

We performed a study of patients undergoing elective surgery over a period of 6 months, between May and December 2016 for degenerative changes in the lumbar spine, treated in one neurosurgical center located in Romania. The inclusion criteria were: age of 18 or older, LBP unresponsive to conservative treatment for more than 3 months, no previous spinal surgery, an indication of one level instrumented fusion for the spinal pathology. Because of the different prognostic and postsurgical recovery, exclusion criteria were lack of consent to participate in the study, the presence of sciatica as the main reason for surgical treatment, presence of tumours or any other disease that could impact outcome (deformity, osteoporosis), severe spondylolisthesis (grade ≥ 3), fractures, spinal cord injuries, cauda equina syndrome or more than one level of fusion, failure to respond to both questionnaires. All the patients were of Romanian nationality. This study was approved by the Institutional Review Board of Iuliu Haţieganu University of Medicine and Pharmacy (approval number: 175/2015). After patients agreed to participate in the study, subjects completed questionnaires 1 to 7 days before surgery and then postoperative after 1 year. In all cases that were included in this study, the surgical intervention consisted from posterior lumbar interbody fusion – with the insertion of pedicle screws at target levels, decompression of the nervous elements, disk removal, filling of the disc space with cancellous bone, rod fixation, and posterolateral fusion.

SF-36 version 2 (Quality Metric, Inc., Lincoln, RI, USA) was used to assess HRQoL. It uses 36 questions to cover eight dimensions of HRQoL and gives physical component (PCS) and mental component summary (MCS) scores.[2] To measure disability, we used the Oswestry Low Back Pain Disability Index (ODI).[3] It consists of a 10-item questionnaire with 6 response categories for every item and defines four grades of disability.[4] The risk of depression was estimated using the MCS scale of the SF-36v2, as described in previous studies and a score under or equal to 42 was used as a cutoff score for evaluating first stage risk of depression.[5,6] Analysis of the SF-36v2 data was done using the QualiyMetric Health Outcomes Scoring Software 4.5 (Quality Metric Inc., Lincoln, RI, USA). Statistical analysis was performed using the IBM SPSS Statistics ver. 20.0 (IBM Co., Armonk, NY, USA). Comparison between groups was performed using the independent or paired samples t-test, as considered appropriate. A Spearman correlation test was performed to analyze the correlation between ODI and SF-36v2 items. A strong correlation was considered as a Spearman correlation coefficient (r_s) under -0.7 and

Table 1. Age, duration of symptoms, diagnosis, and level of lumbar pathology

Variable	Female (n = 31)	Male (n = 30)
Age (yr)	48.67 ± 12.70	50.93 ± 14.54
Duration of symptoms (mo)	4.9 ± 1.6	4.5 ± 1.5
Diagnosis		
Spondylolistesis	15	16
Stenosis	16	14
Location		
L3–4	1	4
L4–5	22	16
L5–S1	8	10

Values are presented as mean ± standard deviation or number.

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a moderate one as an r_s between -0.7 and -0.5. In all cases, a p-value of < 0.05 was chosen as statistically significant.

RESULTS

Out of the initial 70 patients included, 61 completed both surveys and nine patients were excluded from further analysis due

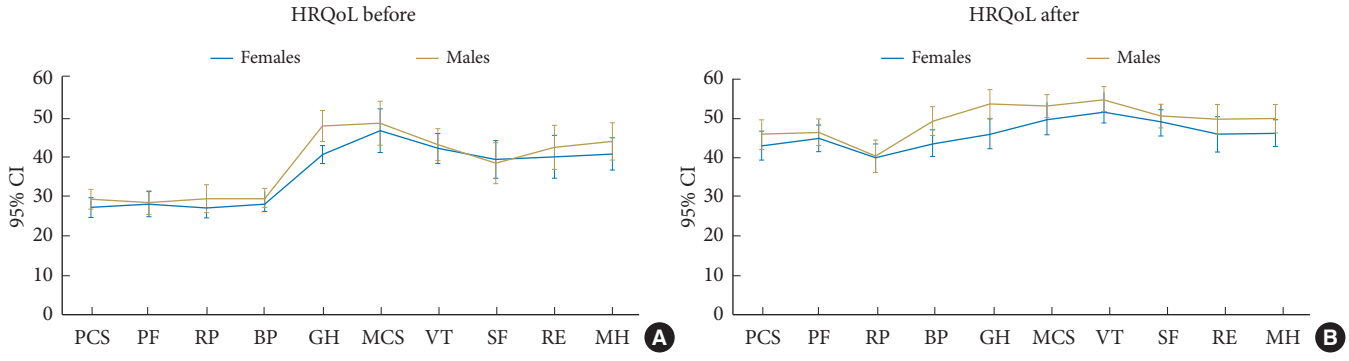

Fig. 1. Comparison of health-related quality of life (HRQoL) as defined by SF-36v2 domains between male and female patients, before (A) and 1 year after (B) the surgical intervention. SF-36v2, Short Form Health Survey version-2.0; PCS, physical component summary; PF, physical functioning; RP, role-physical; BP, bodily pain; GH, general health; MCS, mental component summary; VT, vitality; SF, social functioning; RE, role-emotional; MH, mental health. Bars represent 95% confidence intervals (CIs).

Table 2. SF-36v2 and ODI before and after surgery in female and male patients

Variable	Before		After	
	Female	Male	Female	Male
PCS	27.08 ± 6.96	29.20 ± 7.05	43.02 ± 9.76	46.05 ± 10.03
PF	27.97 ± 8.46	28.32 ± 7.87	44.95 ± 9.24	46.63 ± 9.20
RP	27.02 ± 6.66	29.39 ± 9.55	39.92 ± 10.03	40.39 ± 11.20
BP	28.00 ± 4.86	29.54 ± 6.62	43.78 ± 9.25	49.39 ± 9.80
GH	40.53 ± 6.37	47.78 ± 10.45	46.19 ± 10.78	53.74 ± 9.83
MCS	46.54 ± 15.26	48.52 ± 14.79	49.69 ± 9.83	53.32 ± 7.90
VT	42.06 ± 10.23	42.99 ± 10.86	51.93 ± 7.96	54.88 ± 8.88
SF	39.23 ± 12.99	38.29 ± 13.96	49.04 ± 8.92	50.66 ± 8.04
RE	40.00 ± 15.14	42.47 ± 15.02	46.06 ± 12.24	49.9 ± 10.44
MH	40.66 ± 11.23	43.89 ± 12.62	46.31 ± 9.16	50.17 ± 9.69
ODI	55.91 ± 17.6	56.19 ± 17.25	21.58 ± 15.35	13.43 ± 10.33
Pain intensity	3.29 ± 1.13	3.03 ± 1.00	1.16 ± 0.90	0.97 ± 0.76
Personal care	2.00 ± 1.26	2.37 ± 1.25	0.61 ± 0.80	0.33 ± 0.71
Lifting	3.00 ± 1.44	3.33 ± 1.40	2.13 ± 1.41	1.83 ± 1.60
Walking	2.68 ± 1.28	2.93 ± 1.36	1.00 ± 1.13	0.43 ± 0.63
Sitting	3.35 ± 1.11	2.83 ± 1.60	1.42 ± 1.31	0.80 ± 1.16
Standing	3.39 ± 1.09	3.27 ± 1.20	1.32 ± 1.38	0.93 ± 1.11
Sleeping	1.97 ± 1.38	2.00 ± 1.36	0.45 ± 0.85	0.30 ± 0.65
Sex life	2.22 ± 1.83	2.64 ± 1.85	0.83 ± 1.50	0.36 ± 0.99
Social life	2.61 ± 1.65	2.73 ± 1.64	0.90 ± 1.37	0.23 ± 0.63
Traveling	3.13 ± 1.43	2.97 ± 1.56	0.81 ± 0.95	0.50 ± 0.94

Values are presented as mean ± standard deviation.
SF-36v2, Short Form Health Survey version-2.0; ODI, Oswestry Low Back Pain Disability Index; PCS, physical component summary; PF, physical functioning; RP, role-physical; BP, bodily pain; GH, general health; MCS, mental component summary; VT, vitality; SF, social functioning; RE, role-emotional; MH, mental health.

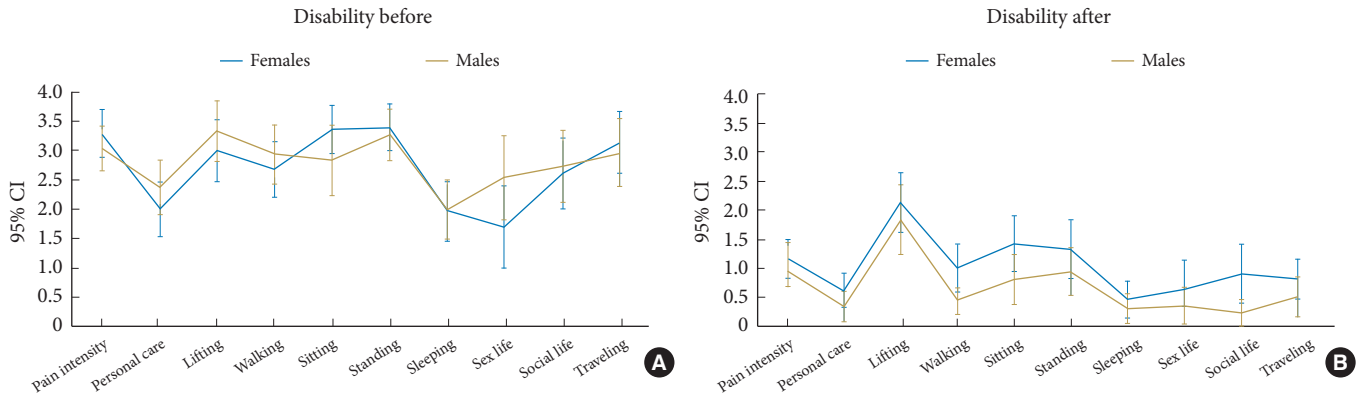

Fig. 2. Comparison of disability as defined by Oswestry Low Back Pain Disability Index domains between male and female patients, before (A) and 1 year after (B) the surgical intervention. Bars represent 95% confidence interval (CI).

Table 3. Spearman correlation coefficients (r_s) between SF-36 and ODI

Variable	PF	RP	BP	GH	VT	SF	RE	MH	PCS	MCS
Female sex										
Pain intensity	-0.53*	-0.37	-0.71†	-0.44	-0.26	-0.32	-0.41	-0.19	-0.55*	-0.19
Personal care	-0.56*	-0.30	-0.45	-0.45	-0.36	-0.35	-0.32	-0.22	-0.49	-0.28
Lifting	-0.71†	-0.38	-0.46	-0.28	-0.21	-0.38	-0.13	-0.15	-0.59*	-0.06
Walking	-0.53*	-0.41	-0.39	-0.50*	-0.40	-0.20	-0.11	-0.38	-0.52*	-0.08
Sitting	-0.36	-0.16	-0.39	-0.28	-0.15	-0.22	-0.36	-0.24	-0.24	-0.26
Standing	-0.68*	-0.46	-0.51*	-0.34	-0.19	-0.29	-0.09	-0.18	-0.66*	0.07
Sleeping	-0.51*	-0.43	-0.39	-0.34	-0.24	-0.19	-0.35	-0.18	-0.46	-0.20
Sex life	-0.69*	-0.44	-0.40	-0.35	-0.40	-0.27	-0.19	-0.23	-0.48	-0.14
Social life	-0.27	-0.15	-0.28	-0.27	-0.27	-0.46	-0.32	-0.09	-0.26	-0.31
Travel	-0.40	-0.34	-0.28	-0.65*	-0.35	-0.43	-0.33	-0.31	-0.42	-0.33
ODI	-0.80†	-0.49	-0.65*	-0.52*	-0.40	-0.44	-0.36	-0.27	-0.70†	-0.24
Male sex										
Pain intensity	-0.37	-0.52*	-0.60*	-0.08	-0.13	-0.36	-0.16	-0.35	-0.45	-0.14
Personal care	-0.59*	-0.39	-0.36	-0.25	-0.42	-0.12	-0.15	-0.10	-0.56*	0.05
Lifting	-0.65*	-0.46	-0.31	-0.38	-0.41	-0.30	-0.44	-0.11	-0.49	-0.25
Walking	-0.58*	-0.36	-0.31	-0.41	-0.46	-0.05	-0.26	-0.19	-0.54*	-0.12
Sitting	-0.58*	-0.33	-0.49	-0.28	-0.27	-0.58*	-0.04	-0.28	-0.57*	-0.16
Standing	-0.78†	-0.53*	-0.55*	-0.41	-0.31	-0.56*	-0.19	-0.35	-0.70†	-0.20
Sleeping	-0.08	-0.30	-0.32	-0.24	-0.43	-0.24	-0.17	-0.34	-0.25	-0.30
Sex life	-0.61*	-0.39	-0.63*	-0.55*	-0.43	-0.60*	-0.43	-0.55*	-0.59*	-0.40
Social life	-0.52*	-0.36	-0.56*	-0.44	-0.48	-0.45	-0.28	-0.54*	-0.52*	-0.33
Travel	-0.51*	-0.64*	-0.13	-0.03	-0.11	-0.31	-0.02	-0.02	-0.55*	0.07
ODI	-0.92†	-0.73†	-0.69*	-0.51*	-0.56*	-0.63*	-0.39	-0.43	-0.86†	-0.32

SF-36v2, Short Form Health Survey version-2.0; ODI, Oswestry Low Back Pain Disability Index; PF, physical functioning; RP, role-physical; BP, bodily pain; GH, general health; VT, vitality; SF, social functioning; RE, role-emotional; MH, mental health; PCS, physical component summary; MCS, mental component summary.
*Moderate correlation (r_s = -0.5 to -0.7). †Strong correlation (r_s = -0.7 to -1).

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to failure to complete the second questionnaire Out of the patients that were included, 31 were women and 30 men. The age, clinical duration of symptoms and diagnosis were similar between the 2 genders and are presented in Table 1.

The baseline scores were similar between females and males in the physical and mental components of the SF-36 at the preoperative evaluation (Fig. 1A). The only statistical difference was in general health (GH), in which male patients had higher scores ($p < 0.01$; 95% confidence interval [CI], -11.66 to -2.83). The ratings of PROs for both genders improved significantly at the postoperative evaluation. Age and type of diagnosis did not influence HRQoL or disability at any of the 2 assessments. The overall postoperative PCS and MCS did not differ significantly at the postoperative evaluation between genders, but male patients reported higher scores in all HRQoL domains, except role-physical (RP) (Fig. 1B). The only significant difference was in the bodily pain (BP) ($p < 0.02$; 95% CI, -10.49 to -0.7) and GH ($p < 0.01$; 95% CI, -12.83 to -2.26) items. Table 2 summarizes the changes in the preoperative and postoperative values of the PCS and MCS components of SF-36v2 and ODI domains according to gender.

At the preoperative evaluation, men presented more disability than women in 7 out of the 10 ODI domains (Fig. 2A).

Both genders reported significant improvement at the postoperative evaluation compared to the preoperative one, but the amount of improvement was higher in all domains in male patients. Male patients exhibited less disability in all fields and significantly less global disability than females ($p < 0.05$; 95% CI, 1.45–14.85). Female patients had a significantly higher walking disability ($p < 0.02$; 95% CI, 0.09–1.03), sitting disability ($p < 0.05$; 95% CI, 0.13–1.25) and impaired social life ($p < 0.02$; 95% CI, 0.1–1.03) (Fig. 2B).

Associations between the 1-year changes in ODI and SF-36v2 domains differed between genders, with ODI and SF-36 PCS showing a better correlation in males than in female patients (Table 3). In women, changes in disability correlated strongly only with changes in PF ($r_s = -0.8$), with the overall PCS ($r_s = -0.7$) and moderately with BP ($r_s = -0.65$) and GH ($r_s = -0.52$) on the PCS scale and showed no correlation with any of the mental components of quality of life. In male patients, ODI showed a strong association with PF ($r_s = -0.92$), RP ($r_s = -0.73$), overall PCS ($r_s = -0.86$) and a moderate one with BP ($r_s = -0.69$) and GH ($r_s = 0.51$) items of the physical component of the SF-36. Disability also showed a moderate correlation with the VT ($r_s = -0.56$) and SF ($r_s = -0.63$) aspects of the MCS scale. All associations were significant at $p < 0.05$.

At the preoperative evaluation, thirteen women vs. ten men (42% vs. 33%) were considered at risk for depression (MCS ≤ 42). At 1 year after surgery, the risk of depression remained higher in female patients while improving significantly in male patients, with nine females vs. three males (29% vs. 10%) scoring under the cut-off value.

DISCUSSION

Our study investigates the connection between gender and outcome after spinal fusion surgery, and it is, to our knowledge the first study on this issue coming from a neurosurgical center located in Eastern Europe. We found that male patients report lower global disability at one year after surgery versus female patients, that they present higher improvements in all aspects of the ODI questionnaire and that the 2 genders have similar scores in HRQoL domains before and after the surgical intervention. Our study is one of the few investigating the correlation between disability and HRQoL in the 2 genders, and our results indicate that the 2 correlate more closely in male compared to female patients.

Women seem to report a lower quality of life both in population norm studies and after treatment for various diseases.[7,8] Some studies investigating this issue in spinal pathology found that females report higher baseline disability and lower HRQoL and a smaller degree of improvement after surgery compared to male patients.[9,10] Whether or not this is true is still a matter of dispute, since other researchers reported that gender does not influence the outcome of surgery.[11] Multiple hypotheses tried to explain the potential differences in PROs reported by male and female patients, including biomechanical factors, pain perception differences, and social considerations.

One theory for the difference reported in PROs between male and female patients takes into consideration the moment when patients present for treatment. When investigating HRQoL after cholecystectomy, authors found that women seeked treatment at an earlier stage of the disease, with lower intensity symptoms and this limited the potential benefit of the surgical procedure.[12] Some of the studies investigating this aspect in spinal surgery found that women seek treatment at more advanced stages of their spinal diseases and this could potentially leave a smaller room for improvement.[13-15] In our study, the time since the debut of symptoms and the surgical intervention was not different between genders, and men and women had similar HRQoL baseline scores. Disability, although not significantly different, was higher in all aspects of male patients at the preop-

erative evaluation, which would suggest that disability evolved faster in men in a similar period. A previous study, performed in a different population and settings, in which one of the authors of the current report took part, also did not find any significant difference in the duration of symptoms between male and female patients and no difference in disability or HRQoL at the preoperative evaluation.[16] This suggests that baseline factors are highly variable in various settings and studies.

Other researchers have suggested that preoperative expectations influence postoperative evaluations.[17] These studies indicate that male patients have higher expectations regarding their outcome, and this leads to higher gains after surgery.[18] In our study, the preoperative expectations were not determined, but we observed that males had a slightly better mental status, despite a higher disability. After surgery, a higher proportion of men had a significant upswing in their psychological state. Although we found no significant difference in the overall HRQoL, the number of male patients at risk of depression determined by the cutoff value of the MCS decreased significantly (10 before vs. 3 after surgery) in men, while remaining relatively high in women (13 previously vs. 9 after surgery).

Various studies found that disability measured by ODI showed little or moderate correlation with HRQoL.[1,19] The reason could be that these instruments measure different aspects of quality of life, have different constructs, or that correlation is influenced by the type of spinal pathology.[19-21] It has been found that women report a higher sensitivity to pain compared to men in the presence of a similar degree of stimuli.[22] This could cause a different interpretation of a similar disability and degree of pain between the 2 genders. In a previous study investigating the issue of this correlation after surgery for thoracolumbar burst fractures, we found a higher association between disability and HRQoL in female patients.[23] In this study, ODI and PCS correlated significantly at 1 year after surgery. The correlation between disability and HRQoL was much higher in males than females. The similar increase in HRQoL compared to females, together with the lower disability and the higher correlation between the 2 in males, seems to support the idea that men and women value differently certain aspects of their overall quality of life. Taken into consideration that previous research showed a slightly better correlation between disability and HRQoL in female patients for other spinal pathologies, the relationship between the two could be disease specific. This would be possible since men and women have been shown to cope differently with specific conditions.[24]

One provocative hypothesis suggests that the prescribed treatment for LBP could vary both according to patient gender and also according to the caregiver's gender. Selection bias could mean that men and women are prescribed different treatments for the same stage of the disease and that the gender of the surgeon influences this choice.[11] One study found that females were more likely to be prescribed conservative treatment, but only when the indication was made by female physicians.[25] In a study looking at lumbar stenosis, men were more likely to receive surgery than women.[26] We could not investigate this issue since the patients included in this study were already selected for surgical treatment and all the surgeons were males.

Finally, it must be underlined again that studies investigating the influence of gender on PROs after spinal surgery for LBP report discordant results.[9,11,14] The reason for this difference is still unclear. When looking at published research, one could assume that influence could vary according to the type of surgical procedures.[11,13,14,16] Other reasons could be differences according to country, culture, surgeon-related factors or other elements, but this is an issue that is still to be determined. The overall health, the socioeconomic status, perceived HRQoL of the population, the way in which people value quality of life and disability, the relation between both physicians and patients and men and women vary from region to region. This difference in cultures has been overlooked in studies investigating the association between gender and outcome after surgery. Recently, it has been shown that there are significant differences between patients undergoing the same orthopedic procedures in 2 different countries.[27] Since population normative values for PROs are diverse, it makes sense that outcome after a surgical procedure will vary accordingly, so comparing 2 different populations rises a series of difficulties. This is also true for any given society since a multitude of factors has to be taken into consideration. For example, low socioeconomic status is associated with poor health functioning and poor emotional health, which in turn is a risk factors of perceiving a low HRQoL after surgery.[27,28] Also, there are different cultural factors, like faiths, traditions, social cohesion and others, which influence the way in which members of the 2 genders perceive themselves and are perceived by others. For example societies in Eastern Europe, score relatively low on the Indulgence and Future Orientation domains of Hofstede's cultural dimensions, which characteristic for pessimistic and traditional cultures, and these traits are significantly different from so-called Western countries.[29] Until now it was not possible to identify all the factors which could cause the differences found in PROs, but studies coming from nonidentical regions could discover unique associations between gender and outcome after

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surgery in different cultural settings. It must be kept in mind that HRQoL and disability are subjective feelings and are reported by individuals in the broader context or their life, society and culture. In the future, it is possible that by putting together data coming from different regions and cultures, we will gain a new perspective, and instead of having a gender-oriented view towards outcomes, we will have a gender-culture oriented view.

There are limitations to our study. We measured outcome only at one moment after the surgical intervention and the results determined by the dynamic of change could be somewhat different. Other studies suggest that changes in symptoms, disability, and HRQoL appear shortly after surgery, with no significant alteration over time, so our results should reflect the overall changes.[30] Another possible limitation is the fact that patients had two diagnoses, but because the number of patients with a specific diagnosis was similar between the 2 genders, and no difference was found according to age or diagnosis, it would seem that this limitation is only apparent. As is the case with other studies with a limited number of patients, together with the fact that each region could have its own particularities, the results of this study should be seen as exploratory findings. Nonetheless, it is one of the first studies coming from the region and offers a unique perspective on the matter. As in many other questions concerning spinal surgery, large, multicenter randomized controlled trials, adapted for cultural and socio-economic specificities are necessary if a definitive link between gender and PROs is to be identified.

CONCLUSION

We found that females and males report similar outcomes in HRQoL after surgery for CLBP while reporting different degrees of disability. Men benefited more than women in all domains of disability and had higher correlations between disability and HRQoL. We found that surgery is more likely to have a positive impact on the mental status of male versus female patients. The cause of the differences between genders should be investigated further while placing this influence in a broader cultural, societal and geographic context. Future studies should also examine the role played by the different correlation between disability and HRQoL in men and women and analyze how this correlation could influence the results of PROs.

CONFLICT OF INTEREST

The authors have nothing to disclose.

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