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Effect of patient characteristics on reported outcomes after total knee replacement

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***Objective*. To evaluate the effect of pre-intervention factors in patient-reported outcomes at 6 months post-operatively following total knee replacement.**

***Methods*. A prospective observational study was carried out using two questionnaires sent to patients while they were on the waiting list for surgery: a generic questionnaire, the Medical Outcomes Study Short Form-36 (SF-36), and a specific questionnaire, the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC). Six months after intervention, patients again received the same questionnaires. The dependent variables were the scores of the three domains of the WOMAC and the eight domains of the SF-36.**

***Results*. We recruited 640 patients. The mean age was 71 yrs and 73.6% of the patients were females. The multivariate analysis, in which the pre-intervention scores for each domain were added as covariates, showed that the most significant pre-intervention predictors were the baseline scores of each domain. Besides that, the social support, low back pain and the baseline score of the mental health domain (SF-36) were the pre-intervention predictors in the three WOMAC domains. With regard to the SF-36 domains the main predictors were the baseline mental health score, comorbidities, low back pain and social support.**

***Conclusions*. The main predictor of outcome at 6 months post-operatively in all eleven domains was the pre-intervention score of each domain. Presence of social support, absence of low back pain and higher baseline SF-36 mental health score were related to the improvement in the health-related quality of life post-operatively.**

KEY WORDS: Total knee replacement, Outcomes, Quality of life, Predictors.

Introduction

Total knee replacement, a procedure that is used mainly for patients with osteoarthritis (OA) [1] is an effective intervention that improves patient's quality of life (QoL), reduces pain and increases functional capability [2–6].

Over the past few years, there has been an increase in the utilization rate of this procedure as well as variations and inequalities in its use [7–10].

The main reasons for performing an intervention of this nature are joint pain, functional limitations or both. Therefore, apart from objectively evaluating the outcomes of the interventions [11] such as changes in radiology or the strength or range of movement, we can also use subjective measurements obtained from the patients. Measuring the health-related QoL (HRQoL) has been increasingly acknowledged as a means of measuring knee replacement outcomes. However, few studies have examined the pre-intervention patient characteristics that might be associated with better HRQoL outcomes.

Previous studies [12–17] have reported that the pre-intervention characteristics associated with outcomes are pre-intervention QoL scores and variables such as, age, gender, obesity, social support, number of comorbidities, pre-intervention short form-36 (SF-36) mental health score and unilateral or bilateral intervention. In spite of that, there is disagreement about which patients are most likely to benefit from the surgical management [18].

The objective of the present prospective study was to determine the effect of some pre-intervention characteristics such as baseline QoL scores, age, gender, obesity, social support, low back pain, comorbidities and the basal score of the mental health domain of the SF-36 questionnaire on the HRQoL outcomes of two questionnaires, Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) and SF-36 reported by patients with OA evaluated at 6 months following total knee replacement.

Patients and methods

This prospective observational study was conducted in seven hospitals belonging to the Basque Health Service (Servicio Vasco de Salud-Osakidetza). The doctors at each hospital were blinded to the purpose of the study. The ethics review board of our institutions approved the study protocol.

To be included in the study the patients had to fulfil the following criteria: be scheduled to undergo total knee replacement (ICD-9-MC Code 81.54) and be on the waiting list at one of the seven hospitals. All patients had to undergo surgery in the participants' hospitals between March 1999 and December 2000, have a diagnosis of primary OA and agree to participate in the study.

The exclusion criteria were patients with terminal diseases, psychiatric and sensory disturbances that could prevent them

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from answering the questionnaires, failure to provide informed consent, prosthesis replacement reinterventions, replacements due to inflammatory diseases, death while on the waiting list and withdrawal of consent to undergo surgery.

HRQoL measurement

Two questionnaires that measure HRQoL were sent to all the patients while they were on the waiting list: a generic questionnaire, the Medical Outcomes Study (MOS) SF-36 and a specific questionnaire, WOMAC. Six months after the intervention, the patients again received the same questionnaires. The first delivery included other relevant sociodemographic variables and the comorbidities included in the Charlson's Index [19]

The WOMAC, a questionnaire specific to hip and knee OA, is a multidimensional scale consisting of 24 items in three domains: pain, 5 items; stiffness, 2 items and ability to function, 17 items. We used the Likert version with five levels of answers for each item, representing different levels of intensity (none, mild, moderate, severe and extreme), with scores from 0 to 4. The translation and validation into Spanish followed the international recommendations for the transcultural adaptation of QoL questionnaires and was performed with the knowledge of the authors of the questionnaires [20, 21]. In the WOMAC, higher scores indicate worse health, and a decrease in the score indicates an improvement. The data can be standardized through linear transformation, so that the score scale for each domain has values from 0 to 100, with 0 indicating optimal health and 100, the worst possible health.

The SF-36, a questionnaire that provides a health status profile [22] is an instrument for measuring QoL generically through eight domains: physical function (PF), bodily pain (BP), general health (GH), role physical (RP), vitality (VT), social function (SF), role emotional (RE) and mental health (MH). The lowest score, 0, corresponds to the worst possible health and 100, to the best possible health. The questionnaire followed the norms for transcultural adaptation and validation [23].

Variables analysed

We used the scores of the three domains of the WOMAC and the eight domains of the SF-36 at 6 months post-operatively as dependent variables.

We used the pre-intervention score of each analysed HRQoL domain, gender, age, obesity, social support, low back pain, comorbidities and MH domain of the SF-36 questionnaire as independent variables. Age was taken as a continuum. To analyse obesity, we used the body mass index (BMI) as a continuum. The patients' social support was determined by a question in the pre-intervention questionnaire in which the patients responded whether they would have assistance during recovery or not. Low back pain was determined by means of a question in the pre-intervention questionnaire given to the patients. The question was 'Do you suffer low back pain at present?'. The MH score was the pre-intervention score of the patients. Comorbidities were determined by means of the Charlson Comorbidity Index by reviewing the patients' medical record. Given the low frequency of comorbidities it was classified in three groups, zero, one and two or more. We studied the effect of the variable 'hospital' since there were seven hospitals included in the study.

Statistical analysis

To describe the sample, means and S.D., and frequencies and percentages were used. For the comparison of baseline study variables and the domains of the HRQoL questionnaires at baseline between respondents and non-respondents to the questionnaires sent 6 months post-operatively, we used chi-square test for categorical variables and *t*-test for continuous variables. Of those who responded, we analysed the relationship amongst independent variables and the variable 'hospital' by means of chi-square for categorical variables and analysis of variance (ANOVA) with Scheffé's method for multiple comparations for continuous variables.

We analysed the effect of each independent variable separately on the scores for each domain on the HRQoL questionnaires at baseline and at 6 months post-operatively. We used *t*-test or ANOVA to analyse the effect of categorical variables, and the linear regression model for continuous variables.

Finally, for a multivariate analysis, general linear models were used to analyse the effects of all independent variables jointly on each domain of the HRQoL questionnaires 6 months post-operatively. In the multivariate analysis performed, we included those variables associated in the univariate analysis and the pre-intervention score of each domain as covariates. We tested for interactions with the variable 'hospital' since there were seven hospitals included.

In all the analyses, P-value <0.05 was considered significant. All statistical analyses were performed using SAS for Windows statistical software, version 8.0.

Results

During the study period, a total of 1369 patients were included in the waiting list. Of these, 281 patients fulfilled some of the exclusion criteria (39 no diagnosis of OA, 131 had surgical management out of the period of study and 111 had other severe diseases that prevented from inclusion). Out of the remaining 1088 patients, 907 (83.4%) agreed to participate and answered the pre-intervention questionnaires. We reviewed the medical records for 875 interventions and found that in 20 patients the surgical management was performed in the second knee during the study period and these patients were excluded; 640 (74.9%) out of 855 answered the follow-up questionnaire 6 months after the intervention, and therefore, the study protocol was applied to them.

At baseline, the mean patient age was 71.81 yrs (S.D. 6.7 yrs; range, 31–89). Women represented 73.6% of the sample. The mean BMI was 29.8 (S.D. 4.1). These and other descriptive variables can be seen in Table 1. Regarding the baseline study variables we only found differences between the patients who answered and those who did not answer the questionnaires sent 6 months post-operatively, in functional limitation domain of the WOMAC and the PF, RP, VT and SF domains of the SF-36 questionnaire (Table 1), having worse HRQoL on those domains those who did not respond at 6 months. When comparing the covariables by hospital, there were only slight differences in the social support variable ($P = 0.02$).

As can be seen in Table 2, there were important improvements in all the domains in the whole sample.

The baseline scores for the HRQoL domains were analysed in both questionnaires. In WOMAC questionnaire the females and patients with low back pain scored highest at baseline and therefore reported more pain, functional limitations, and stiffness (no in-patients with low back pain). On the SF-36, in which the highest score means better HRQoL, the females and patients with low back pain had the worse scores in all domains. There was an association between females and low back pain ($P < 0.001$). The age was negatively correlated with pain, stiffness (WOMAC) and PF (SF-36). The BMI was positively correlated with functional limitation (WOMAC), GH, RP and SF (SF-36). Social support was associated with RE and SF. The MH domain of the SF-36 was correlated with all dependent variables. Finally, there were no differences with regard to hospital included in the study.

The univariate analysis showed a relationship amongst the dependent variables measured at 6 months and the following ones: gender, social support, low back pain, age, MH domain (SF-36)

TABLE 1. Baseline characteristics of the responders and non-responders patients

Variables	Responders $n = 640$	Non-responders $n = 215$	*P*-value
Baseline study variables			
Female, *n*(%)	471 (73.6)	160 (74.4)	0.81
Age, mean (S.D.)	71.8 (6.7)	71.7 (7.3)	0.94
Body mass index (kg/m^2), mean (S.D.)	29.8 (4.1)	30.1 (4.0)	0.41
Presence of social support, *n*(%)	536 (86.2)	182 (88.7)	0.34
Low back pain, yes, *n*(%)	308 (51.8)	103 (51.8)	0.99
Mental health domain (SF-36), mean (S.D.)	60.2 (24.3)	57.7 (21.9)	0.20
Charlson index, *n*(%)			
0	354 (55.3)	115 (53.5)	0.49
1	208 (32.5)	67 (31.2)	
≥ 2	78 (12.2)	33 (15.3)	
WOMAC domains, mean (S.D.)			
Pain	54.6 (18.2)	55.4 (16.6)	0.56
Functional limitation	60.3 (17.7)	64.0 (15.8)	0.007
Stiffness	56.1 (24.5)	58.4 (22.7)	0.21
SF-36 domains, mean (S.D.)			
Bodily pain	36.5 (27.7)	34.0 (25.8)	0.26
Physical function	25.0 (21.4)	20.7 (18.2)	0.004
General health	58.6 (20.0)	56.0 (19.7)	0.11
Role physical	17.0 (31.6)	9.5 (23.4)	< 0.001
Vitality	44.8 (24.8)	38.3 (22.2)	< 0.001
Social functioning	58.7 (31.3)	53.3 (30.7)	0.03
Role emotional	66.4 (45.3)	64.9 (45.3)	0.7
Mental health	60.2 (24.3)	57.7 (22.0)	0.20

TABLE 2. Pre-intervention and 6 months post-operative scores of the studied domains

Domains	Pre-surgical	6 months post-operative	*P*-value
WOMAC domains, mean (S.D.)			
Pain	54.6 (18.2)	22.9 (18.5)	<0.001
Functional limitation	60.3 (17.7)	32.1 (19.7)	<0.001
Stiffness	56.1 (24.5)	30.0 (22.5)	<0.001
SF-36 domains, mean (S.D.)			
Bodily pain	36.5 (27.7)	54.6 (30.0)	<0.001
Physical function	25.0 (21.4)	48.8 (24.2)	<0.001
General health	58.6 (20.0)	61.0 (21.0)	0.001
Role physical	17.0 (31.6)	44.8 (43.8)	<0.001
Vitality	44.8 (24.8)	56.8 (24.7)	<0.001
Social functioning	58.7 (31.3)	74.9 (27.3)	<0.001
Role emotional	66.4 (45.3)	74.5 (41.0)	<0.001
Mental health	60.2 (24.3)	68.1 (23.9)	<0.001

and comorbidities. Neither BMI nor hospitals were associated. In both questionnaires, we tested for interactions amongst the variables and did not find any relation.

The multivariate analysis, in which the baseline or pre-operative scores for each domain were added as covariates to the factors previously included (gender, social support, low back pain, age, MH domain and comorbidities), showed that in the SF-36 physical domains (Table 3) the most important predictive variables were the pre-intervention scores for all domains. Besides that, in the BP domain the pre-intervention MH score, the lack of low back pain and comorbidity were also predictive variables of better outcome. In the PF domain, the pre-intervention mental health score and comorbidities were associated with the outcome at 6 months. In the RP domain the pre-intervention mental health score and social support were associated with better outcome. Finally in GH domain, mental health, social support, gender and comorbidities were predictive ones. Regarding the mental domain (Table 4), again the pre-intervention score of each domain and the pre-intervention mental health score were the best predictive variables. In addition, comorbidities (VT, SF and RE), the social support (RE and MH), lack of low back pain (VT and MH) and gender (SF) emerged as predictive factors.

Regarding the three WOMAC domains (Table 5), the most important predictive variables were, as well, the baseline scores for each domain. Second, the absence of low back pain and the pre-intervention score of mental health affected the outcomes at 6 months in the three domains. Regarding pain dimension, age and social support were associated. The gender and social support correlated with functional capacity dimension. Finally, gender and age were predictive variables for the stiffness domain. Comorbidities as measured by Charlson's Index were associated with pain and functional limitation domains in the WOMAC questionnaire.

Discussion

Our data provide additional evidence on the improvement in terms of HRQoL experienced by patients who underwent total knee replacement at 6 months after surgery. In this study, the broad sample and the use of two questionnaires to measure the outcomes are particularly noteworthy. We have evaluated by means of separate multivariate models 12 domains of two questionnaires, WOMAC and SF-36.

Our results along with the other authors's suggest [12,24] that the baseline score of each domain is the best single predictor of a patient's post-operative QoL.

Besides that, this article also illustrates the independent impact of some pre-intervention variables. Considering social support, our method of measurement, i.e. a question posed to patients in the pre-intervention questionnaire, may introduce some bias, because there was a time lapse (up to 6 months after surgery) during which the situation may have changed. This said, the analysis indicated that patients with social support obtained better scores at 6 months after surgery in the three WOMAC domains and four out of eight SF-36 domains (GH, RP, RE and MH). These data agree with other studies that measured a similar concept using other questions, such as marital status in hip replacement [25] or knee replacement [12], living alone or not [26]. Social support can be defined as the existence or availability of people who care about an individual and on whom one can rely

TABLE 3. Multivariate analysis of post-operative change in SF-36* physical domains

	SF-36											
	Bodily pain (BP)			Physical function (PF)			General health (GH)			Role physical (RP)		
Variables	Diff.†	95% CI	*P*-value	Diff.†	95% CI	*P*-value	Diff.	95% CI	*P*-value	Diff.	95% CI	*P*-value
Gender												
Female	0			0			0			0		
Male	0.75	−4.83, 6.34	0.79	−1.73	−6.50, 3.03	0.47	−4.87	−8.17, −1.58	0.004	−0.26	−9.89, 9.37	0.96
Age (yrs)	0.24	−0.10, 0.58	0.25	−0.08	−0.38, 0.21	0.57	0.02	−0.19, 0.22	0.88	0.16	−0.43, 0.76	0.58
Social support												
No	0			0			0			0		
Yes	3.97	−2.81, 10.76	0.25	4.28	−1.42, 9.99	0.14	4.53	0.55, 8.51	0.02	14.42	2.97, 25.87	0.01
Low back pain												
Yes	0			0			0			0		
No	7.03	2.12, 11.95	0.005	1.19	−2.88, 5.26	0.57	2.25	−0.64, 5.14	0.12	2.28	−5.80, 10.35	0.58
Charlson Index												
0	0			0			0			0		
1	−5.49	−10.53, −0.44	0.03	−4.45	−8.72, −0.18	0.04	−2.89	−5.87, 0.09	0.057	−2.81	−11.23, 5.62	0.51
≥2	−7.01	−14.26, 0.28	0.059	−6.32	−12.46, −0.17	0.04	−5.12	−9.42, −0.82	0.02	−7.81	−19.91, 4.28	0.20
Pre-intervention MH	0.09	−0.01, 0.20	0.09	0.18	0.09, 0.27	<0.0001	0.12	0.06, 0.19	<0.001	0.23	0.05, 0.41	0.01
Pre-intervention BP	0.33	0.24, 0.43	<0.0001	–	–	–	–	–	–	–	–	–
Pre-intervention PF	–	–	–	0.24	0.15, 0.33	<0.0001	–	–	–	–	–	–
Pre-intervention GH	–	–	–	–	–	–	0.55	0.48, 0.63	<0.001	–	–	–
Pre-intervention RP	–	–	–	–	–	–	–	–	–	0.21	0.08, 0.34	0.001

*SF-36, high scores indicate better HRQoL.
†Mean difference between categories or by unit after adjustment by all other variables.
–Not applicable

TABLE 4. Multivariate analysis of post-operative change in SF-36* mental domains

	SF-36											
	Vitality (VT)			Social Functioning (SF)			Role emotional (RE)			Mental health (MH)		
Variables	Diff.†	95% CI	*P*-value	Diff.†	95% CI	*P*-value	Diff.	95% CI	*P*-value	Diff.	95% CI	*P*-value
Gender												
Female	0			0			0			0		
Male	1.48	−3.06, 6.03	0.52	−5.50	−10.74, −0.26	0.04	−0.14	−8.54, 8.29	0.97	1.7	−2.51, 5.90	0.43
Age (yrs)	0.06	−0.20, 0.33	0.64	−0.01	−0.33, 0.30	0.9	0.34	−0.19, 0.88	0.19	0.11	−0.14, 0.36	0.40
Social support												
No	0			0			0			0		
Yes	0.75	−4.59, 6.10	0.78	4.77	−1.51, 11.04	0.13	10.58	0.71, 20.46	0.03	6.46	1.40, 11.52	0.01
Low back pain												
Yes	0			0			0			0		
No	5.46	1.67, 9.25	0.0048	2.12	−2.35, 6.60	0.35	4.33	−2.75, 11.43	0.23	3.64	0.09, 7.20	0.04
Charlson Index												
0	0			0			0			0		
1	−4.12	−8.07, −0.17	0.04	−4.97	−9.67, −0.28	0.04	−10.76	−18.24, −3.28	0.005	−3.69	−7.44, 0.05	0.05
≥2	−7.46	−13.07, −1.84	0. 009	−7.47	−14.21, −0.72	0.03	−4.01	−14.74, 6.72	0.4	−4.72	−10.09, 0.65	0.08
Pre-intervention VT	0.32	0.22, 0.42	<0.0001	–	–	–	–	–	–	–	–	–
Pre-intervention SF	–	–	–	0.21	0.13, 0.30	<0.0001	–	–	–	–	–	–
Pre-intervention RE				–	–	–	0.14	0.04, 0.23	0.004	–	–	–
Pre-intervention MH	0.20	0.10, 0.30	<0.0001	0.19	0.08, 0.30	0.001	0.36	0.18, 0.55	0.0001	0.47	0.39, 0.55	<0.0001

*SF-36, high scores indicate better HRQoL.
†Mean difference between categories or by unit after adjustment by all other variables
–Not applicable.

TABLE 5. Multivariate analysis of post-operative change in WOMAC* domains

	WOMAC*								
	Pain			Functional limitation			Stiffness		
Variables	Diff.†	95% CI	*P*-value	Diff.	95% CI	*P*-value	Diff.	95% CI	*P*-value
Gender									
Female	0			0			0		
Male	3.30	−0.15, 6.81	0.06	5.18	1.36, 9.0	0.008	4.98	0.38, 9.58	0.03
Age (yrs)	−0.24	−0.45, −0.03	0.04	−0.20	−0.44, 0.03	0.08	−0.28	−0.57, −0.004	0.046
Social support									
No	0			0			0		
Yes	−5.13	−9.31, −0.95	0.02	−7.25	−11.83, −2.67	0.002	−5.51	−11.05, 0.003	0.051
Low back pain									
Yes	0			0			0		
No	−5.26	−8.24, −2.27	<0.001	−4.26	−7.52, −1.0	0.01	−6.20	−10.13, −2.25	0.002
Charlson index									
0	0			0			0		
1	3.04	−0.07, 6.16	0.055	3.2	−0.15, 6.65	0.06	0.5	−3.62, 4.63	0.8
≥2	6.50	2.0, 11.0	0.005	6.6	1.70, 11.52	0.008	3.3	−2.62, 9.22	0.3
MH (SF-36)	−0.10	−0.17, −0.04	0.001	−0.10	−0.17, −0. 03	0.005	−0.09	−0.17, −0.007	0.03
Pre-intervention pain	0.26	0.18, 0.34	<0.0001	–	–	–	–	–	–
Pre-intervention FL‡	–	–	–	0.29	0.19, 0.38	<0.0001	–	–	–
Pre-intervention stiffness	–	–	–	–	–	–	0.15	0.07, 0.23	<0.001

*WOMAC, high scores indicate worse HRQoL.
†Mean difference between categories or by unit after adjustment by all other variables.
‡Functional limitation.
–Not applicable.

when needed. There are some ways to assess social supports: first, some situations may be better disentangled by formal aids (material help) whereas others may be better resolved by informal events (sympathy, advice); second, social support may refer to the number of people to rely on and the degree of satisfaction with the available and provided support. Finally, one can distinguish between daily support and problem-oriented support [27]. Social support may have an effect at least through two mechanisms: directly, through assistance and support to the patient during recovery and through the patient's motivation to recover. Social support may also be important when considering whether or not to undergo surgery [28]. In fact, according to some authors [12] lack of social support may be a barrier to surgery, due to the high dependency on others observed during the first post-operative month. The satisfaction with the social support perceived may contribute to enhance HRQoL to a greater extent than the number of individuals to rely on [27].

Although the literature is controversial [2, 5, 17, 29] about the effect of the age, our data indicate that age is not a barrier when considering total knee replacement given the effect on the reported outcomes. Elderly people are more sedentary and have less demand for prosthesis implants. Therefore, the longevity, stability and range of movement of the implant are less important than for younger people. Surgery, however, can improve physical function in 80-yr-old patients [30] and the relief from pain it provides is similar to that in young people, with no greater need for evaluation post-operatively and with similar levels of functionality [2, 31, 32].

Regarding the effect of the presence of low back pain it can be seen as a good predictor for worse outcome in the WOMAC domains and some SF-36 domains. The effect of the low back pain has also been studied in hip replacement [33] and the results were similar. The isolated influence of this variable on WOMAC could be controversial given that the WOMAC questionnaire seems to capture more than just knee or hip pain or dysfunction, and is influenced by the presence of low back pain [34].

The effect on the outcomes of the SF-36 MH domain has been previously studied [17, 35] and has demonstrated a strong influence. Our data demonstrate that a higher baseline score in that domain, i.e. better mental health status, is associated with better score at 6 months post-surgical management in all but one of the studied domains. One possible explanation is that, according to the authors [36] this domain has a great influence of depressive symptoms without a diagnosis and dissatisfaction with life, which could be related to the symptomatology of some of the patients.

Regarding gender, first on average, women presented with more pre-intervention pain and disability. Despite worse pre-intervention functional status, our data indicated that, women had greater improvement than men post-operatively since the detected baseline differences between them decreased or were undetected 6 months after surgery. The effect seems to be valuable on SF and GH domains of SF-36 and functional limitation of the WOMAC questionnaire. Perhaps, women take longer to seek intervention either because they have a greater fear of the risk involved or because of the burden on the family that an intervention implies. Another possible explanation is the gender-related difference in the referral patterns [37] between the first and second levels of health care. Nevertheless, the study of the reasons of such differences was beyond the scope of this article.

As with our data, the negative effect of the comorbidities has been documented in some domains [17], as in the PF dimension where differences have been found 2 yrs after surgery. In our case, age was not associated with comorbidity. The effects of the comorbidities have been seen in hip replacement [33] or in studies with hip and knee replacement [29] or knee replacement [38]. However, recent studies suggest that Charlson's Index should not be used as a measure of multimorbidity in HRQoL studies [39], particularly in this patient group with low levels of serious comorbidity and following joint replacement surgery [40].

Because many candidates for total knee replacement are overweight, particularly those with OA, the effect of obesity on the outcomes of surgery is important to surgeons. From clinical and radiological standpoints [41], worse outcomes have been obtained in obese patients with a follow-up of at least 5 yrs. Our analysis led to the conclusion that obesity is not a predictor of

worse outcome in terms of HRQoL at 6 months. Our data were similar to other studies that analysed BMI in two or more than two categories [5, 12, 18, 42–44].

In brief, based on our data we can conclude that after adjusting by gender and age, the baseline score of each domain is the strongest determinant of the post-operative score at 6 months. Besides this the presence of social support, absence of low back pain or comorbidities and the basal score of the MH domain of the SF-36 are good predictors.

There are some limitations in our study. First, we have not been able to analyse another variable such as unilateral *vs* bilateral interventions that could have been correlated with outcomes. Another possible limitation was that we were unable to study HRQoL variables just before the intervention, but only when the patients were on the waiting list. Finally, those who did not respond to the questionnaire sent at 6 months post-surgical management had worse pre-operative scores in some HRQoL. Although these differences were statistically significant, they do not seem to represent a group with severe impairment as compared with responders, given the magnitude of the differences in points among both groups.

Rheumatology	Key messages
	• The pre-intervention score is the strongest determinant of the post-operative scores at 6 months in each domain. • The presence of social support, absence of low back pain and the pre-intervention score of the MH domain of the SF-36 are good predictors

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