

## Research article

## Could patients undergoing total knee replacement achieve an improvement on psychological distress?

Manuel Jiménez<sup>\*1</sup>, Cristóbal Martínez<sup>1</sup>, Alfonso Espinosa<sup>1</sup>, Andrea Nieto<sup>1</sup>, José A. Salido<sup>1</sup><sup>1</sup> Department of Orthopedic Surgery and Traumatology, University General Hospital of Ciudad Real, Ciudad Real, Spain<sup>\*</sup>Corresponding author: Manuel Jiménez MD, Department of Orthopedic Surgery and Traumatology, University General Hospital of Ciudad Real, Ciudad Real, Spain, E-mail: manolo6271@yahoo.es

Received: June 25, 2018; Accepted: July 11, 2018; Published: : July 13, 2018

**Abstract**

Background and purpose: The existence of psychological distress is considered a predictive factor for poorer outcomes in medical literature. The purpose was to assess the influence of total knee replacement (TKR) on psychological distress. Patients and Methods: Of a series of 265 patients, 72 were mainly excluded due to cognitive impairment (65 cases). The initial sample accomplished the visual analogue scale (VAS), the Knee Society Score, the Hospital Anxiety and Depression Scale (HADS) for distress and the Western Ontario and McMaster Universities Osteoarthritis (WOMAC) for quality of life. Subsequently, only the representative sample was divided into two groups as regards whether or not there was evidence of preoperative psychological distress. The statistical analysis consisted in the comparison of mean values from Test T-Student, ANOVA and a multiple-comparison study by Bonferroni method. Results: The preoperative distress proportion of women to men was 44.5% (61 / 137) to 10.7% (6/56). These outcomes resulted in a statistically significant value (P=0,015). A year after surgery, both groups improved all their scales decreasing the number of patients with distress (41.8%). However, the data were only statistically significant in the WOMAC scale (P=0.015). Interpretation: This study suggests that patients with preoperative distress further improve their quality of life as compared to those individuals who did not present it. It could be attributed to the physical and psychological improvement in the first group versus only the physical one in the second group.

**Introduction**

Total knee replacement should be aimed not only at the clinical and functional improvement but also at enhancing the quality of life. Thus, the preoperative mental health and, especially psychological distress has acquired a significant relevance in specialized fields such as Psychiatry, Oncology, Cardiology and Orthopedics in medical literature. The presence of psychological distress has always involved poorer outcomes in each of preceding medical specialities.

According to Hans Selye's distinction between positive stress or eustress and negative stress or psychological distress, this latter term could be considered as an unpleasant emotional experience (from the point of view physical, psychological -cognitive, behavioral and emotional, social and / or spiritual) that can interfere with the

ability to deal effectively with the physical ailments of a disease such as osteoarthritis and its treatment [1-4].

The joint pain is a response to a nociceptive stimulus that requires the integration of mind (psychological distress) and body (knee). So, the somatic expression of the osteoarthritis will result in the development of psychological distress and emotional response to the pain (Krikorian). When undergoing TKR is achieved an improvement in joint pain, the disappearance and potential reversibility of distress might be a fact.

The purpose of this study was to analyze the connection between psychological distress and total knee replacement by taking into account functional outcomes, quality of life and evolution of distress after surgery [2-12].

## Methods

The method to follow was a longitudinal, observational, prospective study. An initial cohort of 265 patients from the waiting list undergoing primary total knee replacement was the chosen sample. The recruitment period ran from October 2006 to December 2008.

## Patients

The exclusion criteria for the study were as follows: cognitive impairment (1), severe psychiatric disorder (2), people aged under 50 years old (3), reoperations in the same limb or fractures during follow-up (4) and death (5). Patients with bilateral arthroplasty had covered more than 12 months period between the two procedures being considered as different patients.

## Data elements

All patients were assessed preoperatively and one year after the surgery. Epidemiological data (age, sex, weight, height, diagnosis and laterality) and personal history were collected during the preoperative assessment. Patients accomplished the following questionnaires:

1. The Miniexamen Cognoscitivo in order to exclude patients with cognitive impairment. Scores of 23 or less in patients aged over 65 years- old and the ones of 27 or less in those under 65 years- old were considered as a positive outcome.
2. The Hospital Anxiety and Depression (HADS) for diagnosing patients in psychological distress. This questionnaire has the advantage of not being influenced by symptoms of physical pain. The presence of psychological distress was considered when the score was superior or equal to 10 [13].
3. The Visual Analogue Scale (VAS), to assess the subjective severity of pain.
4. The Knee Society Score (KSS) [13,14] ,with its subscales of knee and pain as an instrument for assessing the specific outcome of TKR, essentially from the physician's perspective. Both subscales are assessed separately, with a maximum score of 100 for each.
5. The Western Ontario and McMaster Universities Osteoarthritis (WOMAC) [15-17] in its Likert version, comprising 24 questions, grouped into 3 domains, in which 5 measure pain, 2 joint stiffness, and 17 the difficulties in performing physical functions. It is a specific self-administered questionnaire for the hip and knee that assesses quality of life. The total score WOMAC varies from 0 to 96 points corresponding a lower score to a better quality of life.

During the annual assessment patients were asked to describe their degree of satisfaction with respect to the outcome of the surgery according to the categories of bad, poor, good and very good.

## Statistics and analyses

The normal distribution of quantitative variables was assessed using the Kolmogorov-Smirnov test in the exploratory analysis of the variables. The descriptive statistics for qualitative variables were analyzed by means of the Frequency Distribution tables and sector graphics. The quantitative variables were described using measures of central tendency (mean, median and mode), dispersion (standard deviation), and graphical representation (histograms).

T-Student test and analysis of variance were used to compare means of the inferential analysis, the Bonferroni method was applied in the study of multiple comparisons whereas the Chi square test was used for the comparison of proportions. The Fisher exact test was used when the Chi square test was not considered a valid approximation. The P values less than 0.05 were considered statistically significant.

## Results

Of the initial cohort of 265 patients, 72 were not included in the study. The cause for exclusion was the cognitive impairment (65 cases), rheumatoid arthritis in a patient under 50, fractures of the operated limb (two patients during the follow-up) and not related to the procedure (four cases—exitus). None of the patients was diagnosed with a severe psychiatric disorder, neither before the operation nor during the follow-up. The descriptive statistics data are collected in the table 1. It informs on the most relevant clinic characteristics of the patients in the sample. The table 2 shows the scores on the different scales used, indicating the means and standard deviations in parenthesis.

Therefore, the final sample analyzed consisted of 193 patients. Of this final sample, 67 people (34.7%) had preoperative distress, whereas 126 (65.3%) did not. Distress was substantially more frequent in women (44.5%) compared to men (10.7%). This difference was statistically significant according to the Pearson Chi-square test ( $p=0.001$ ). In the yearly medical check-up, the number of patients with distress decreased from 67 to 39.

The table 3 shows the influence of preoperative distress on the scores of the different scales. Patients with preoperative distress slightly got better scores on all scales. However, the improvement was only statistically significant in terms of quality of life assessed by the WOMAC index ( $p=0.015$ ). On the remaining scales used—the VAS, Knee Society functional and knee joint subscale—the differences between patients with and without distress were small and not statistically significant.

**Table 1.** Characteristics of study population.

Total n: 193	Frequencies	Percentage
Sex:		
Women	137	71%
Men	56	29%
Age:	71,52 (DT:5,35)	
BMI	31,81 (DT:4,39)	
Laterality:		
Right	95	49,2%
Left	98	50,8%
Background:		
HT	76	39,37%
Diabetes	27	13,9%
Heart diseases	25	12,9%
COPD	6	3,1%
Rheumatoid arthritis	7	3,6%
Prior osteotomy	9	4,6%
Contralateral TKA	63	32,6%
Social support:		
Family	86	44,5%
Partner	79	41%
Others (not social support or nursing home.)	28	14,5%

BMI: body mass index; COPD: chronic obstructive pulmonary disease; HT: hypertension; TKA: total knee arthroplasty ; DT: standard deviation.

**Table 2.** Comparison of study parameters before and 12 months after surgery.

	Preoperative		12 months	
VAS	7,44	(1,27)	2,79	(2,07)
Knee Society knee joint	38,42	(11,33)	84,10	(9,59)
Knee society functional	41,55	(14,7)	67,33	(16,9)
WOMAC Index	57,10	(11,45)	18,58	(11,2)

VAS: Visual Analogue Scale; WOMAC: Western Ontario and McMaster Universities Osteoarthritis Index

**Table 3.** Study Outcomes According to Presence of Preoperative Distress

	No Preoperative distress	Preoperative distress	Difference in the means (95% CI)	<i>p</i>
WOMAC	-36,72	-41,91	5,188 (1,017 - 9,359)	0,015
Knee Society Functional	25,75	25,82	-0,069 (-5,33 - 5,19)	0,980
Knee Society Knee Joint	45,19	46,59	-1,406 (-5,45 - 2,63)	0,494
VAS	-4,60	-4,72	0,126 (-0,518 - 0,77)	0,699

CI: confidence interval; VAS: Visual Analogue Scale; WOMAC: Western Ontario and McMaster Universities Osteoarthritis Index

**Table 4.** Scores on the different scales according to the four possible changes in distress status (see text).

	Sub-groups	N	Mean	Standard deviation	95% confidence interval of the mean		<i>p</i>
WOMAC	1	112	-37,642	13,994	-40,26	-35,02	0,006
	2	25	-38,640	15,410	-45,00	-32,27	
	3	42	-43,857	12,088	-47,62	-40,09	
	4	14	-29,357	14,269	-37,59	-21,11	
VAS	1	112	-4,7518	2,185	-5,16	-4,34	0,133
	2	25	-4,4520	2,161	-5,34	-3,55	
	3	42	-4,8952	2,091	-5,54	-4,24	
	4	14	-3,4143	1,903	-4,51	-2,31	
Knee Society Functional	1	112	26,875	16,874	23,71	30,03	0,122
	2	25	22,200	14,511	16,21	28,19	
	3	42	27,976	19,476	21,90	34,04	
	4	14	16,785	20,532	4,93	28,64	
Knee Society Knee Joint	1	112	45,062	13,210	42,58	47,53	0,150
	2	25	41,920	14,085	36,10	47,73	
	3	42	49,381	13,350	45,22	53,54	
	4	14	46,214	14,734	37,70	54,72	

VAS: visual analogue scale; WOMAC: Western Ontario and McMaster Universities Osteoarthritis Index

\* Shading highlights sub-groups that obtained the best (3) and worst (4) scores.

1. Patients who did not have preoperative distress or distress in the study visit at 1 year
2. Patients who had preoperative distress and after a year.
3. Patients who had preoperative distress but not distress after a year
4. Patients who did not have preoperative distress but had distress after a year

**Table 5.** Multiple Sub-group by Sub-group comparisons of the four Sub-groups for outcome on the WOMAC by change in psychological distress.

			Mean Difference	95% Confidence Interval		p
WOMAC	1	2	0,997	-7,15	9,14	1,00
		3	6,21	-0,45	12,87	0,083
		4	-8,28	-18,72	2,15	0,214
	2	1	-0,997	-9,14	7,15	1,00
		3	5,21	-4,08	14,52	0,820
		4	-9,28	-21,57	3,01	0,273
	3	1	-6,21	-12,87	0,45	0,083
		2	-5,21	-14,52	4,08	0,820
		4	-14,50	-25,86	-3,13	0,005
	4	1	8,28	-2,15	18,72	0,214
		2	9,28	-3,01	21,57	0,273
		3	14,50	3,13	25,86	0,005

\*The Sub-groups differences that appear shaded were statistically significant in terms of quality of life.

According to the different possibilities for the evolution of the distress, the sample was divided into 4 groups:

1. Patients who did not have preoperative distress or distress in the annual check-up (112 patients).
2. Patients who had preoperative distress and in spite of the being undergone, they continued with this state. In fact, it was confirmed during the annual check-up (25 patients).
3. Patients who had preoperative distress but not in the annual check-up (42 patients). This group showed an improvement of this disorder with the surgery.
4. Patients who did not have preoperative distress but they did in the annual check-up showing an evident psychological deterioration after TKR (14 patients).
5. According to the outcomes obtained from the four analyzed scales, patients in group 3 showed the best scores whereas those in group 4 got the worst ones in 3 of the 4 scales (VAS, WOMAC index and Knee Society functional subscale).

An overall comparative study of the four groups was conducted by considering the differences in the different scales by means of ANOVA test. The overall comparative study only showed statistically significant differences between the groups in terms of quality of life by using the

WOMAC index ( $p=0.006$ ). The results are shown in Table 4. Subsequently, a multiple comparisons study between the groups was conducted by using Bonferroni test. The results are showed in Table 5.

The multiple comparisons study only showed statistically significant differences between groups 3 and 4 in terms of quality of life assessed by using the WOMAC index ( $p=0.005$ ). The other scales analyzed did not show significant differences. With regard to the degree of satisfaction, 84.9% of the patients showed outcomes considered as good or very good.

### Discussion

MEC-35 questionnaire was used in order to bestow greater reliability and validity of our results upon this study. The outcomes of such a questionnaire resulted in the exclusion of 65 patients (24.5%) due to cognitive impairment. This figure is appealing not only for its size, but also due to the fact of the low use or at any case its limited information on the use of cognitive tests in the medical literature. In fact, these studies should be considered essential for a coherent response of patients to avoid bias in the results.

Our study analyzed the influence of preoperative psychological distress on the different scales (Table 3).

We found that preoperative surgical distress did not influence on the specific outcomes of the performance of TKR. It was assessed using the Knee Society Score (KSS) and by means of which it was concluded that the group differences were not significant on the functional subscale ( $p=0.980$ ) or the subscale concerning the knee itself ( $p=0.494$ ). Studies such as those by Brander, et al. [18] and Caracciolo et al. [19] pointed to factors such as anxiety and depression as predictive factors of worse outcomes after TKA.

Moreover, Munir observes how patients' level of satisfaction undergoing TKR who presented preoperative distress was not affected. He states, as in our series, that women are more likely to show preoperative psychological distress. In addition, Duivenvoorden obtained similar outcomes in his study on TKR and hip replacement after 12 months. However, patients showed a lower rate of satisfaction in patients with preoperative anxiety and depression.

On the other hand, patients with preoperative distress in our study achieved better outcomes in quality of life. By using WOMAC index, we came to the conclusion there was no evidence of psychological distress which was statistically significant ( $p=0,015$ ). This result contrasts with Lingards work who observed how patients with preoperative distress obtained lightly worse results after 12 and 24 months of surgery. Nevertheless, it was not significant in terms of pain and function related to the performance of TKR. There is evidence of the influence of distress not related to prosthetic surgery in medical literature. This influence is always negative concerning the outcomes of treatments and its relation with other diseases. Thus, Nicholson et al. [20] found that distress was related to an increased risk of cardiovascular diseases. Trask et al. [21] reported a relationship between psychological distress and poor outcomes in bone marrow transplant and Daubs et al. [22] found that psychological distress was predictive of poor outcomes of surgery for spinal column.

The former statements making reference to the negative influence of preoperative psychological distress contrast with the improvement of quality of life in our study of these patients ( $p=0,015$ ) facing those who did not show this disorder before the surgery. Krikorian et al. [23] states it is essential to integrate mind (distress) and body (knee) when considering pain. Thus, the response to a somatic expression (articular pain) turns out to be an emotional response (distress) that could be reversible.

According to the former observation, our results could be due to the fact that there were not only a physical improvement (decrease in joint pain) and a psychological improvement (decrease in the number of patients with distress) after intervention. It is noteworthy that psychological distress reversed in 28 out of 67 cases in the postoperative annual check-up. The reversible nature of psychological distress is also apparent in the study of Lingard.

To provide statistically significant data to support our findings, the sample was divided into four groups according to how distress progressed and overall and multiple comparison tests were performed (Tables 4 and 5). The overall comparative test showed statistically significant differences ( $p=0.006$ ) in terms of quality of life between patients from group 3 and 4. Whereas patients in group 4 developed postoperative distress, the ones in Group 3 presented an improvement in distress disappearing one year after surgery.

Likewise, groups 3 and 4 also showed statistically significant differences in quality of life (Table 5) in the multiple comparisons study ( $p=0.005$ ). These results confirm the fact patients with preoperative distress in this study, would be the ones who achieve a better improvement in quality of life after TKR. It would be due to the existence of not only an important improvement in psychological distress but also a physical one with this procedure.

#### Acknowledgements

The authors would like to express their gratitude to María de los Angeles Toro López for assistance as language editor.

#### Author Contributions

Manuel Jiménez and José A. Salido conceived of the study and participated in its study. Alfonso Espinosa; Cristóbal Martínez; Andrea Nieto and Manuel Jiménez conducted the acquisition of data. Manuel Jiménez and Cristóbal Martínez carried out the analysis and interpretation of data and participated in drafting the manuscript. All authors read and approved the final manuscript.

#### Conflicts of Interest

All the authors declare that they have no competing interests.

#### Funding (Financial Disclosure)

No funding

#### Ethical Approval

The study protocol was approved by the local institutional review board, and all patients gave written informed consent to participate in the study

## References

1. NCCN clinical Practice Guidelines in Oncology. Distress Management. National Comprehensive Cancer Network 2009.
2. Lingard EA, Katz JN, Wright EA, et al. Predicting the outcome of total knee arthroplasty. *J Bone Joint Surg Am.* 2004; 86: 2179-86.
3. Heck DA, Robinson RL, Patridge CM, et al. Patients outcomes alter knee replacement. *Clin Orthop Relat Res.* 1998; 356: 93-110.
4. Scott CEH, Howie CR. Predicting Dissatisfaction following total knee replacement. *J Bone Joint Surg Br.* 2010; 92-B: 1253-8.
5. Selye H. The evolution of the stress concept. *Am Sci.* 1974; 61: 692-99.
6. Trief PM, Grant W, Fredrickson BA. Prospective study of psychological predictors of lumbar surgery outcome. *Spine.* 2000; 25 (20): 2616-21.
7. Lingard EA, Riddle D. Impact of Psychological Distress on Pain and Function Following Knee Arthroplasty. *J Bone Joint Surg Am.* 2007; 89: 1161-9.
8. Lobo A, Ezquerro J, Gómez FB. The Mini-Cognitive Exam. A simple and practical test to detect intellectual alterations in medical patients. *Luso Spanish Acts Neurology and Psychiatry.* 1979; 3: 189-202.
9. Folstein MF, Folstein SE, McHugh PR. Mini mental state". A practical method for grading the cognitive state of patients for the clinician. *J Psychiatr Res.* 1975; 12, 189-98.
10. Zigmond AS, Snaith RP. The Hospital Anxiety and Depression Scale. *Acta Psychiatr Scand.* 1983; 67: 361-70.
11. Faller H, Kirschner S, Koenig A. Psychological distress predicts functional outcome at three and twelve months after total knee arthroplasty. *Gen Hosp Psychiatr.* 2003; 25, 372-3.
12. Grau Martín A, Suñer Soler R, Abulí Picart P, et al. Niveles de ansiedad y depresión en enfermos hospitalizados y su relación con la gravedad de la enfermedad. *Med Clin (Barc).* 2003; 120 (10): 370-5.
13. Insall JN, Dorr LD, Scott RD, et al. Rationale of the Knee Society clinical rating system. *Clin Orthop.* 1989; 248: 13-14.
14. Alicea J. Sistemas de Puntuación de la rodilla artrítica y su utilidad. In: Insall JN, WN Scout. Edición en Español. Rodilla. Madrid: Marbán; 2006. p. 1507-46.
15. Bellamy N, Buchanan WW, Goldsmith CH, et al. Validation study of WOMAC: a health status instrument for measuring clinically important patient relevant outcomes to anti-rheumatic drug therapy in patients with osteoarthritis of the hip or knee. *J Rheumatol.* 1988; 15: 1833-40.
16. Battle-Gualda E, Esteve-Vives J, Piera Riera MC. Traducción y adaptación al español del cuestionario WOMAC específico para artrosis de rodilla y cadera. *Rev Esp Reumatol.* 1999; 26: 38-45.
17. Escobar CA, Quintana JM, Bilbao A, Azcarate J, Güenaga JI. Validation of the Spanish Version of the WOMAC Questionnaire for patients with Hip or Knee Osteoarthritis. *Clinical Rheumatology.* 2002; 21: 466-71.
18. Brander V, Gonder S, Martin E, Stulberg SD. Pain and Depression influence outcome 5 years after knee replacement surgery. *Clinical Orthopaedics and related research.* 2007; 464; 21-26.
19. Caracciolo B, Giaquinto s. Self-perceived distress and self-perceived functional recovery after recent total hip and knee arthroplasty. *Arch Gerontol Geriatr.* 2005; 41 (2): 177-81.
20. Nicholson A, Fuhrer R, Marmot M. Psychological distress as a predictor of CHD events in men: the effect of persistence and components of risk. *Psychosom Med.* 2005; 67: 522-30.
21. Trask PC, Paterson A, Riba M, et al. Assessment of psychological distress in prospective bone marrow transplant patients. *Bone Marrow Transplant.* 2002; 29 (11): 917-25.
22. Daubs M, Patel A, Willick S, et al. Clinical Instinct vs. Standardized Questionnaire: The Spine Specialists Ability to Detect Psychological Distress. *The Spine J.* 2008; 18: 1915-1918.
23. Krikorian A, Limonero JT, Maté J. Suffering and distress at the end-of-life. *Psychooncology.* 2011; 11.

To cite this article: Jiménez M, Martínez C, Espinosa A, et al. Could patients undergoing total knee replacement achieve an improvement on psychological distress?. *Japan Journal of Medicine.* 2018; 1:5.

© Jiménez M, et al. 2018.