Central Sensitization and Neuropathic Pain Synergistically Affect Inferior Patient-Reported Outcomes Following Total Knee Arthroplasty

Mansoo Kim[1], Yong In[1]
[1]Seoul St. Mary's Hospital

INTRODUCTION: Available studies on the relationship between central sensitization (CS) and neuropathic pain (NP) and the association of these with patient-reported outcome measures (PROMs) in patients who underwent total knee arthroplasty (TKA) are insufficient. The purpose of this study was to investigate this association.

METHODS: A total of 316 patients who underwent primary TKA for end stage knee OA were enrolled. CS condition was defined in patients with a score of 40 or higher on the Central Sensitization Inventory (CSI). NP condition was defined in patients with a score of 13 or more on the Pain Detect Questionnaire (PDQ). PROMs were also evaluated based on the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) score preoperatively and two years postoperatively. The patients were divided into 4 groups, group 1 with both CS and NP conditions, group 2 with only CS condition, group 3 with only NP condition, and group 4 without CS and NP condition. Pre- and postoperative PROMs were compared among the groups.

RESULTS:

There were 90 patients (28.5%) with both CS and NP conditions, 33 patients (10.4%) with only CS condition, 83 patients (26.3%) with only NP condition, and 110 patients (34.8%) with neither condition. All WOMAC subscores showed significant differences among the four groups before and after surgery (all $p < 0.05$). As a result of post hoc analysis before surgery, group 1 showed significantly inferior WOMAC pain, function, and total scores compared to groups 2, 3, and 4 (all $p < 0.05$). Groups 2 and 3 showed worse preoperative results in WOMAC subscores compared to group 4 (all $p < 0.05$). These results remained the same at two years after surgery.

DISCUSSION AND CONCLUSION: Each condition, CS and NP, was associated with inferior PROMs following TKA. Furthermore, patients with both CS and NP conditions showed the most inferior PROMs compared to patients with either condition alone or without either condition.

Postoperative results of correlations between four groups

Dependent Variable	Generation grouping		Mean difference	*p* value
WOMAC Pain	Group 1	Group 2	2.8	<0.001
		Group 3	3.2	<0.001
		Group 4	4.7	<0.001
	Group 2	Group 3	0.3	1.000
		Group 4	1.9	0.018
	Group 3	Group 4	1.6	0.005
WOMAC Function	Group 1	Group 2	9.6	<0.001
		Group 3	12.1	<0.001
		Group 4	18.2	<0.001
	Group 2	Group 3	2.5	1.000
		Group 4	8.6	<0.001
	Group 3	Group 4	6.1	<0.001
WOMAC Total	Group 1	Group 2	13.4	<0.001
		Group 3	16.4	<0.001
		Group 4	24.9	<0.001
	Group 2	Group 3	3.0	1.000
		Group 4	11.6	<0.001
	Group 3	Group 4	8.6	<0.001

WOMAC, Western Ontario and McMaster Universities OA Index

Preoperative and postoperative WOMAC score

	Group 1 (n=90)	Group 2 (n=33)	Group 3 (n=83)	Group 4 (n=110)	*p*-value
Preoperative					
Total WOMAC†	67.8 (9.9)	59.0 (10.0)	58.2 (16.0)	51.0 (15.7)	<0.001
Pain	14.0 (2.7)	12.0 (3.5)	11.7 (4.0)	9.8 (3.9)	<0.001
Stiffness	5.2 (1.6)	4.3 (2.1)	4.8 (1.7)	4.1 (2.2)	<0.001
Function	48.6 (7.3)	42.7 (7.3)	41.6 (11.8)	37.2 (11.5)	<0.001
Postoperative 2 years					
Total WOMAC†	40.5 (14.1)	27.1 (14.0)	24.1 (16.8)	15.5 (10.4)	<0.001
Pain	6.6 (3.8)	3.8 (3.3)	3.5 (3.7)	1.9 (1.9)	<0.001
Stiffness	3.4 (1.5)	2.4 (1.7)	2.3 (1.9)	1.4 (1.4)	<0.001
Function	30.4 (10.7)	20.8 (10.4)	18.3 (12.4)	12.3 (8.1)	<0.001

*Values are presented as means and standard deviations

WOMAC, Western Ontario and McMaster Universities OA Index