

Central Sensitization is associated with Persistent Postoperative Pain and Inferior Patient-Reported Outcomes in Patients Undergoing Unicompartmental Knee Arthroplasty



In Y, Choi KY, Kwak DH, Cho RK, Jang HJ, Yang SC, Kim MS
Seoul St. Mary's Hospital
The Catholic University of Korea



Conflict of interest

In Y, MD, Ph.D.

Choi KY, MD.

Kwak DH, MD.

Cho RK, MD.

Jang HJ, MD.

Yang SC, MD.

Kim MS, MD.

We have no financial conflict to disclose.

Introduction

◆ Unicompartamental knee arthroplasty (UKA)

➤ Worldwide recognized & validated procedure for unicompartamental OA

➤ Less invasive alternative to TKA with high satisfaction

Vasso 2018 EOR

◆ High incidence of medial knee discomfort and Pain

➤ Not associated with postoperative radiographic outcomes and preoperative OA state

*Edmondson 2011 JOSR
Crawford 2018 JAAOS*

◆ Revision rate for unexplained pain

➤ UKA > TKA (23% vs 9%)

Baker 2012 JBJS

Introduction

- ◆ Recently, Interest & research of Central Sensitization ↑

Kim 2015 Pain Practice

- ◆ **Central sensitization(Serotonin & Norepinephrine)**

- Abnormal and intense of pain mechanism by CNS
- High level of preoperative pain, low pain thresholds, & severe pain in early postoperative period after TKA

Lundblad 2008 JBJS Br

- ◆ **Preoperative CS is related to persistent pain and patient dissatisfaction after primary TKA**

Kim 2015 Pain Practice

Purpose

- ◆ **Studies on the relationship between CS and PROMs including postoperative pain are still lacking in patients undergoing UKA**
- ◆ **To investigate the association between Central sensitization and postoperative pain and PROMs after UKA**

Materials and Methods

Unilateral unicompartmental knee arthroplasty
131 cases (131 patients)

2014 ~ 2019
Single surgeon
Minimum 2 years F/U

Exclusion criteria (10 patients)
Osteonecrosis: 2 cases
Inflammatory arthritis: 0 case
Traumatic osteoarthritis: 2 cases
History of knee infection: 1 case
Follow up loss: 5 cases

Group 1 (CSI score < 40)
95 patients (78.5%)

Group 2 (CSI score \geq 40)
26 patients (21.5%)

Materials and Methods

- ◆ **Patient demographics & potential risk factors**
- **Central sensitization inventory (CSI)**
 - ✓ Newly developed and validated self-reported questionnaire for assessing the severity of CS
 - ✓ 25-item questionnaire with somatic, emotional symptoms & pain sensitivity-related questions
 - ✓ 40 points → Criterion of high and low CSI score groups

Materials and Methods

- ◆ **The forgotten joint score (FJS)**
- Validated the PRO scale for evaluation of joint awareness during daily life activity following arthroplasty & minimized the ceiling effect
- 12 item questionnaire for evaluating the awareness effect
- Every question is scored 1 (never) to 5 (mostly) according to the selected response categories.
- The raw score is linearly transformed to a 0-100 scale and then reversed to obtain the final score
- The total score ranges from 0 to 100, High score → good outcome

Results: Demographics

Demographics	CSI score < 40 (n=95)	CSI score ≥ 40 (n=26)	p-value
Age (years)	61.5 ± 5.9	60.2 ± 7.4	0.366
Gender (Female, %)	84 (88.4%)	24 (92.3%)	0.732
BMI (kg/m ²)	25.6 ± 3.0	26.7 ± 3.3	0.114
Side (L, %)	54 (56.8%)	12 (46.2%)	0.332
Preoperative FTA (deg)	0.2 ± 2.6 valgus	0.6 ± 4.2 valgus	0.619
Postoperative 2Y FTA (deg)	5.3 ± 2.4 valgus	4.1 ± 3.2 valgus	0.078
CSI score	22.7 ± 9.8	45.2 ± 4.2	<0.001
Preoperative values (deg)			
Flexion contracture	3.4 ± 5.4	3.0 ± 5.3	0.774
Flexion	127.7 ± 11.7	126.1 ± 15.4	0.583
Postoperative 2Y values (deg)			
Flexion contracture	0.0 ± 0.0	0.0 ± 0.0	-
Flexion	128.6 ± 3.2	128.0 ± 3.7	0.523

Results: Postoperative WOMAC

	CSI score < 40 (n=95)	CSI score ≥ 40 (n=26)	<i>P-value</i>
Preop WOMAC			
Pain	15.8 ± 6.0	18.4 ± 3.9	0.04
Stiffness	4.6 ± 3.2	5.6 ± 2.1	0.132
Function	36.2 ± 10.4	46.0 ± 9.0	<0.001
Total	56.0 ± 12.9	69.9 ± 11.0	<0.001
Postop 2Y WOMAC			
Pain	1.6 ± 1.5	3.4 ± 5.6	0.018
Stiffness	1.0 ± 1.4	1.4 ± 1.8	0.495
Function	8.8 ± 5.7	14.8 ± 19.0	0.024
Total	11.4 ± 7.7	19.6 ± 26.1	0.005

- ◆ **WOMAC pain, function and total score were significantly worse in the CS group (preop & postop 2Y)**

Postoperative Forgotten Joint Score (FJS)

	CSI score < 40 (n=95)	CSI score ≥ 40 (n=26)	<i>P-value</i>
Forgotten Joint Score	72.8 ± 12.4	64.4 ± 16.2	0.005
1. In bed at night	1.1 ± 0.9	1.2 ± 1.0	0.476
2. When sitting on a chair for more than a jour	1.4 ± 0.9	1.5 ± 0.8	0.521
3. When you are walking for more than 15 min	1.1 ± 0.8	1.3 ± 0.7	0.191
4. When taking a bath/shower	1.2 ± 0.8	1.5 ± 0.7	0.099
5. When travelling in a car	1.0 ± 0.7	1.2 ± 1.0	0.153
6. When climbing stairs	1.0 ± 0.8	1.5 ± 0.8	0.008
7. When walking on uneven ground	1.2 ± 0.8	1.6 ± 1.1	0.045
8. When standing up from a low-sitting position	1.2 ± 0.8	1.6 ± 1.1	0.044
9. When standing for long periods of time	0.8 ± 0.8	1.2 ± 1.0	0.051
10. When doing housework or gardening	1.0 ± 0.8	1.5 ± 1.0	0.003
11. When taking a walk or hiking	1.1 ± 0.8	1.6 ± 0.9	0.004
12. When doing your favorite sport	0.9 ± 0.6	1.3 ± 0.8	0.006

◆ FJS at 2 years after surgery was also significantly lower in the CS group

Conclusion

◆ Central Sensitization

➔ Risk factor for persistent postop pain and greater knee joint awareness after UKA

◆ *UKA in central sensitized patients*

➤ *Advised of their increased risk of postoperative persistent pain and inferior FJS*

➔ *Closely observation after UKA*

Reference

1. Kim, M.S.; Koh, I.J.; Choi, K.Y.; Seo, J.Y.; In, Y. Minimal Clinically Important Differences for Patient-Reported Outcomes After TKA Depend on Central Sensitization. *J Bone Joint Surg Am* 2021, *103*, 1374–1382.
2. Koh, I.J.; Kang, B.M.; Kim, M.S.; Choi, K.Y.; Sohn, S.; In, Y. How Does Preoperative Central Sensitization Affect Quality of Life Following Total Knee Arthroplasty? *J Arthroplasty* 2020, *35*, 2044–2049.
3. Dave, A.J.; Selzer, F.; Losina, E.; Usiskin, I.; Collins, J.E.; Lee, Y.C.; Band, P.; Dalury, D.F.; Iorio, R.; Kindsfater, K., et al. The association of pre-operative body pain diagram scores with pain outcomes following total knee arthroplasty. *Osteoarthritis Cartilage* 2017, *25*, 667–675.
4. Kim, S.H.; Yoon, K.B.; Yoon, D.M.; Yoo, J.H.; Ahn, K.R. Influence of Centrally Mediated Symptoms on Postoperative Pain in Osteoarthritis Patients Undergoing Total Knee Arthroplasty: A Prospective Observational Evaluation. *Pain Pract* 2015, *15*, E46–53.
5. Lape, E.C.; Selzer, F.; Collins, J.E.; Losina, E.; Katz, J.N. Stability of Measures of Pain Catastrophizing and Widespread Pain Following Total Knee Replacement. *Arthritis Care Res (Hoboken)* 2020, *72*, 1096–1103.
6. Sasaki, E.; Kasai, T.; Araki, R.; Sasaki, T.; Wakai, Y.; Akaishi, K.; Chiba, D.; Kimura, Y.; Yamamoto, Y.; Tsuda, E., et al. Central Sensitization and Postoperative Improvement of Quality of Life in Total Knee and Total Hip Arthroplasty: A Prospective Observational Study. *Prog Rehabil Med* 2022, *7*, 20220009.
7. Wyld, V.; Palmer, S.; Learmonth, I.D.; Dieppe, P. The association between pre-operative pain sensitisation and chronic pain after knee replacement: an exploratory study. *Osteoarthritis Cartilage* 2013, *21*, 1253–1256.
8. Wyld, V.; Sayers, A.; Lenguerrand, E.; Gooberman-Hill, R.; Pyke, M.; Beswick, A.D.; Dieppe, P.; Blom, A.W. Preoperative widespread pain sensitization and chronic pain after hip and knee replacement: a cohort analysis. *Pain* 2015, *156*, 47–54.
9. Kim, M.S.; Koh, I.J.; Sohn, S.; Kang, B.M.; Kwak, D.H.; In, Y. Central Sensitization Is a Risk Factor for Persistent Postoperative Pain and Dissatisfaction in Patients Undergoing Revision Total Knee Arthroplasty. *J Arthroplasty* 2019, *34*, 1740–1748.
10. Koh, I.J.; Kim, M.S.; Sohn, S.; Song, K.Y.; Choi, N.Y.; In, Y. Duloxetine Reduces Pain and Improves Quality of Recovery Following Total Knee Arthroplasty in Centrally Sensitized Patients: A Prospective, Randomized Controlled Study. *J Bone Joint Surg Am* 2019, *101*, 64–73.