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Original Article

The effect of diaphragmatic breathing exercise on pain, anxiety, and depression in patients undergoing total knee replacement: A randomized controlled trial

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Abstract

Aim: The aim of this study was to investigate the effect of Diaphragmatic breathing exercise on pain, anxiety, and depression in patients undergoing total knee replacement.

Material and Methods: It is a randomized controlled trial. The study population consisted of patients who underwent total knee replacement surgery in the orthopedic ward of Çankırı State Hospital between May and August 2019. The study sample included a total of 38 patients satisfying the inclusion criteria. Stratified randomization was used to assign the patients into sex-matched intervention group (n=19) and control group (n=19). Patients in the intervention group were also trained in the Diaphragmatic breathing exercise procedure. Descriptive characteristics form, visual analogue scale and hospital anxiety and depression scale were used to collect data. Pain scores were evaluated at 1, 2, 4, 8, 12, and 24 hours postoperatively, while the anxiety and depression was applied on the postoperative day 2. Data were analyzed using descriptive statistics, Chi-square test, and Mann–Whitney U test.

Results: Mean age was 65.26±6.73 years in the intervention group and 68.78±5.88 years in the control group. There were also no significant differences in Visuel Analog Scale pain scores (P>.05). Mean score anxiety was significantly lower in the intervention group compared to the control group (P=.033). However, the difference in the depression was not significant (P>.05).

Conclusion: The results of our study demonstrated that Diaphragmatic breathing exercise had no effect on pain and depression but reduced anxiety after total knee replacement surgery.

Keywords: Anxiety; breathing exercise; depression; pain; randomized controlled trial; total knee replacement

INTRODUCTION

Total Knee Replacement (TKR) is one of the most common orthopedic surgical procedures. TKR involves extensive muscle and bone repair, it is known to be one of the most painful operations (1,2). Based on data from 2010–2014, it is predicted that TKR surgeries performed in the USA will increase by 85% and reach 1.26 million procedures by 2030 (3). In Australia, 2003–2013 data suggest that the annual incidence of TKR will exceed 161,000 procedures by the year 2030 (4). According to data from the Health Statistics in 2015 about the incidence of TKR is 67 in every 100.000 among healthy individuals in Turkey (5).

TKA is an elective procedure that is, in most cases, reserved for patients experiencing chronic, debilitating symptoms that continue to persist despite exhaustion of all conservative treatments and surgical interventions such as osteotomy and arthroscopy (6). Inadequate use of analgesics and poor pain management after surgery can cause delayed mobilization, increased risk of venous thrombosis, insufficient wound healing, prolonged hospital stay, unnecessary psychological distress, and lower patient satisfaction (7,8). In the studies, many patients experience psychological problems such as depression, anxiety, negative feelings, bored and not feeling like doing anything, fatigue, moodiness, discouraged, and helplessness and pain (9,10). Patients experienced during the postoperative period, 3.9% had 'no pain', 8.9% had 'mild pain', 22.7% had 'moderate pain' and 64.5% had 'severe pain'. In all, 70% of patients with anxiety experienced severe pain (10). Patients have expressed a need for social or psychological support. In order for patients to avoid such pain-related complications, they must be taught how to cope with pain (9,10).

The severe pain, anxiety, and stress patients experience following TKR surgery may impact their postoperative recovery (11). Studies have shown that nonpharmacological interventions for postoperative pain

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reduce pain intensity and opioid use (12,13). One of these nonpharmacological methods is diaphragmatic breathing exercises (DBE). Also known as diaphragmatic breathing or deep breathing, DBE is an effective holistic mind-body training to cope with stress and psychosomatic conditions. DBE involves contraction of the diaphragm and expansion of the belly to deepen inhalation and exhalation, which consequently decreases breathing rate and maximizes blood gas concentrations (14).

DBE plays an important role in pain signaling, autonomic activation, emotional regulation, acid-base equilibrium, and anti-inflammatory processes (15). DBE has been shown to enhance emotions, effectively reduce anxiety and its symptoms, and alleviate negative emotions such as depression, stress, and anger (15-17).

Nonpharmacologic nursing applications in the postoperative period orthopedic patients (relaxation techniques, back massage, cold/hot compresses, etc.) help the individual both to attain his/her expectations and to reduce his/ her fear, anxiety, and pain (1,18). There are few studies in the literature on the effect of DBE on patients who underwent TKR. One of these is a semi-experimental study by Lim et al. (11) that evaluated the effect of relaxation intervention (breathing exercises and guided imagery) on patients who underwent TKR. The authors reported that relaxation techniques were effective in managing patients' pain and anxiety. Another study evaluating the effect of relaxation techniques and back massage among patients who underwent TKR and Total Hip Replacement (THR) showed that these techniques reduced patients' pain and anxiety during bed rest (1). However, Larsen et al. (19) investigated the effect of a DBE program in patients with Osteoarthritis (OA) and found that DBE had no effect in alleviating pain or improving physical function.

A few studies have used DBE to prevent pain and sensory tension in patients who underwent TKR (1,11). However, different relaxation techniques were used in addition to DBE in these studies. To the best of our knowledge, no studies have examined the efficacy of DBE alone. Given the rising incidence of TKR, it is imperative that we strengthen our arsenal of effective interventions against the pain and psychological problems associated with this procedure. The aim of the present study was to evaluate the effect of DBE on pain, anxiety, and depression in patients who underwent TKR.

MATERIAL and METHODS

Design and Sample

This was a randomized, controlled experimental study. The study sample was comprised of 38 patients admitted to the orthopedics ward of a hospital in the Central Anatolia region of Turkey for TKR between May and August 2019. In light of population-based research demonstrating higher prevalence of pain among women (20), the patients were first stratified by sex. Block randomization was then performed by coin-flipping method to assign the patients in equal numbers to one of the two study groups. The CONSORT flow diagram for the study is shown in Figure 1.

Selection criteria; Patients who were scheduled for TKR and agreed to participate in the study were included. Exclusion criteria; Patients with dementia, Alzheimer's disease, chronic obstructive pulmonary disease, or psychiatric disorders, and those with hearing problems that prevented communication were excluded.

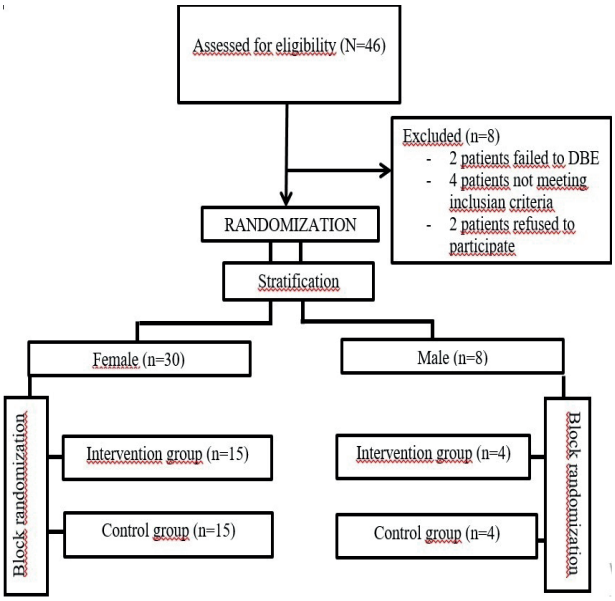

Figure 1. Randomization of the sample into groups

Intervention

Patients included in the intervention group were informed about how the pain assessment scale would be used and how their pain would be assessed. This was followed by DBE instruction and practice as described below. The patients were asked to perform DBE at 1, 2, 4, 8, 12, 24 hours after surgery and when they were experienced pain and anxiety. Patients in the intervention group received application of cold pads to the operative area, pain medication and DBE. Patients in the control group received routine postoperative TKR nursing care that consisted of application of cold pads to the operative area and pain medication.

Intervention and control groups was taken the same pain medication such as narcotic analgesics + Nonsteroidal Anti-inflammatory Drugs.

DBE procedure

The day before the operation, at a time when the patient had no anxiety, the patient was taken to a quiet room and asked to lie on the bed. Attention was paid to ensuring absence of each patient's relatives in the room, closing of curtains/screens around the patient's bed, and the silence and quietness of the room for the application of interventions in a comfortable environment. For the first 5 minutes, the researchers explained how the exercise is done with pictures and demonstrated it to the patient. After that, the patient was asked to perform the exercise for 10 minutes under supervision by the researchers.

If the patient performed DBE correctly, practice was discontinued. If not, the patient was asked to practice for another 5 minutes. If the patient still could not perform the exercise correctly at the end of this time, they were excluded from the sample. DBE was performed according to the Cleveland Clinic guideline (21). Cleveland Clinic guideline was demonstrated DBE was done while the knee is flexed. However patients post TKR return from theatre with a compression bandages for 24 hours approximately thus limiting their ability to flex their knees. Pain post TKR is directly related to attempting knee flexion. Therefore after the operation, they were asked to perform the DBE while lying without flexion. The patients were asked to perform DBE at 1, 2, 4, 8, 12, 24 hours after surgery and when they were experienced pain and anxiety.

Data Collection Tools

Descriptive characteristics form

A form was developed based on a review of the literature. It was comprised of six questions regarding the patient's age, sex, marital status, education, living expenses, and type of anesthesia received during the TKR operation (1,11).

Visual Analogue Scale (VAS)

This one-dimensional measure of pain intensity is a reliable and easily applicable scale that is widely accepted in the literature. VAS is used to convert nonmeasurable variables into numeric values. The 10-cm scale is labeled 0 ("no pain") at one end and 10 ("extreme pain") at the other, with values indicated at each cm in between (22,23).

Hospital Anxiety and Depression Scale (HADS)

The HADS was developed by Zigmond and Snaith in 1983. The scale is designed not to diagnose but to identify risk groups by rapid screening for anxiety and depression in patients with somatic disorders. The HADS was adapted to Turkish by Aydemir (24) Cronbach's alpha coefficient of internal consistency was 0.85 for the anxiety subdimension, 0.77 for the depression subdimension, while item-total correlation coefficients varied between 0.81 and 0.85 for the anxiety subdimension and between 0.73 and 0.77 for the depression subdimension. The Turkish version of HADS was determined to be valid and reliable. The scale consists of 14 items, 7 of which assess signs of depression and 7 that assess signs of anxiety. Responses are evaluated on 4-point Likert-type scale scored between 0 and 3. However, responses to the even-numbered items decrease in severity and are scored from 3 to 0, while responses to the odd-numbered items are scored from 0 to 3. The sum of the odd-numbered items gives the anxiety score and the sum of the even-numbered items gives the depression score (24).

Data Collection

The intervention and control groups completed the descriptive characteristics form preoperatively, the VAS was applied at postoperative 1, 2, 4, 8, 12, and 24 hours, and the HADS was used on postoperative day 2 (Table 1). Patients may experience problems that affect their comfort such as pain, nausea/vomiting, or hypotension during the first 24 hours after surgery. Therefore, HADS assessment was performed on the second postoperative day to avoid interference from these factors. Data were collection by researchers.

Table 1. Procedure and data collection plan (Measurements and Times)

	T1	T2	T3	T4	T5	T6	T7
VAS	X	X	X	X	X	X	
HADS							X

VAS: Visual Analog Scale; HADS: Hospital Anxiety and Depression Scale; T1: postoperative 1 hour; T2: postoperative 2 hours; T3: postoperative 4 hours; T4: postoperative 8 hours; T5: postoperative 12 hours; T6: postoperative 24 hours; T7 = postoperative 2 days

Data Analysis

Statistical analyses were performed using Statistical Package for Social Science 20.0 (SPSS, IBM Corp., Armonk, NY, USA). Data were expressed in number, percentage, mean, and standard deviation. Chi-square and Mann–Whitney U tests were used for analysis.

Ethical considerations

Ethics committee approval (protocol no; 129-2019) was obtained from the Ethics Committee of a University in Central Anatolia. Institutional approval to conduct this study in orthopedics ward was obtained from A State Hospital in Central Anatolia in Turkey. Verbal and oral consent were obtained from patients who agreed to participate in the study. Also, the study was registered under the number: NCT04225169.

RESULTS

Descriptive characteristics of the intervention and control groups are shown in Table 2. Mean age in the intervention and control groups was 65.26±6.73 years and 68.78±5.88 years, respectively (P>.05). There were no significant differences between the intervention and control groups in terms of anesthesia type, sex, marital status, education level, or income (P>.05) (Table 2).

Mean pain scores in the intervention and control groups are shown in Table 3. There were no statistically significant differences between the groups in terms of mean pain score after surgery at 1 hour (U=177.000, P=.901), 2 hours (U=147.000, P=.304), 4 hours (U=141.000, P=.238), 8 hours (U=131.500, P=.148), 12 hours (U=121.500, P=.068), or 24 hours (U=160.500, P=.546) (Table 3).

Table 2. Comparison of descriptive characteristics of patients in the intervention and control groups

Variable	Intervention group (n=19)	Control Group (n=19)	U	p[a]
	X±SD	X±SD		
Age (years)	65.26±6.73	68.78±5.88	130.000	0.139
	n (%)	n (%)	X^2	p[a]
Anesthesia type				
Spinal anesthesia	10 (52.63)	14 (73.68)	1.810	0.313
Epidural anesthesia	9 (47.37)	5 (26.32)		
Sex				
Female	15 (78.9)	15 (78.9)	**0.000**	1.000
Male	4 (21.1)	4 (21.1)		
Marital status				
Married	18 (94.7)	15 (78.9)	2.073	0.340
Single	1 (5.3)	4 (21.1)		
Education level				
Illiterate	7 (36.8)	8 (42.1)		
Primary school	10 (52.7)	10 (52.6)	0.400	0.819
Secondary school	2 (10.5)	1 (5.3)		
Expenses				
Low	11 (57.9)	14 (73.7)	1.052	0.494
Equal to Income	8 (42.1)	5 (26.3)		

SD: Standard deviation, U: Mann–Whitney U test, X^2: Chi-square, P[a]> 0.05

Table 3. Comparison of mean postoperative pain scores of patients in the intervention and control groups after TKR

VAS (mean pain score)	Interventiongroup (n=19)		Control Group (n=19)		U	p[a]
	MR	SR	MR	SR		
1 hour	19.32	367.00	19.68	374.00	177.000	0.901[a]
2 hours	17.74	337.00	21.26	404.00	147.000	0.304[a]
4 hours	17.42	331.00	21.58	410.00	141.000	0.238[a]
8 hours	16.82	321.50	22.08	419.50	131.500	0.148[a]
12 hours	16.39	311.50	22.61	429.50	121.500	0.068[a]
24 hours	18.39	349.50	20.61	391.10	160.500	0.546[a]

VAS: Visual Analog Scale; MR: Mean rank; SR: Sum of ranks; U: Mann–Whitney U test; Pa>0.05

Table 4. Comparison of mean postoperative anxiety and depression scores of patients in the intervention and control groups on postoperative day 2

HADS	Interventiongroup (n=19)		Control Group (n=19)		U	p[a]
	MR	SR	MR	SR		
Anxiety subdimension	15.68	298.00	23.32	443.00	108.000	0.033[b]
Depression subdimension	16.39	311.50	22.61	429.50	121.500	0.081[a]

HADS: Hospital Anxiety and Depression Scale; MR: Mean rank; SR: Sum of ranks; U: Mann–Whitney U test; P[a]>0.05, P[b]<0.05

Postoperative 2 days, the mean anxiety and depression subdimension scores of patients in the intervention and control groups are given in Table 4. There was a significant difference between the groups in terms of mean HADS anxiety scores (U=108.000, P=.033), but no significant difference in mean depression scores (U=121.500, P=.081) (Table 4).

DISCUSSION

This study assessed the effect of DBE on pain, anxiety, and depression in patients who underwent TKR. We observed no significant differences were observed between the experimental (DBE) and control (standard hospital care)

groups in terms of mean depression scores, while the intervention group had significantly lower anxiety than the control group.

Previous studies involving the use of the nonpharmacological intervention DBE in different sample groups showed that it decreased pain, anxiety, and depression (17,25,26). A randomized controlled study by Büyükyılmaz and Aştı (2013) investigated the effects of back massage and relaxation techniques (e.g., rhythmic breathing, muscle relaxation exercises, and listening to music) on pain, anxiety, and vital signs in patients who underwent TKR and THR on postoperative days 1–3 and found that these techniques were effective in reducing pain and anxiety. In a quasi-experimental study examining the effects of relaxation interventions (breathing exercises and guided imagery) on pain, anxiety, and stress in TKR patients, the relaxation interventions were found to decrease pain and anxiety (11). In these studies, different relaxation techniques were used in addition to DBE. Our finding that DBE did not have a significant effect on pain suggests that DBE alone is not sufficient for coping with the intense pain caused by musculoskeletal tissue repair. DBE should be used with different nonpharmagological intervention (massage, guided imagery) for pain management after TKR.

In another experimental study that assessed the effect of nonpharmacological interventions on pain and anxiety after THR and TKR on postoperative days 1, 2, and 3, the intervention group used a set of nonpharmacological strategies including music, a relaxation tape, a stress ball, massage, and deep breathing. The intervention group exhibited significantly lower mean anxiety score on postoperative days 1 and 2 compared to the control group, but there was no difference between the groups in terms of postoperative pain intensity (13). In a pretest-posttest experimental study that assessed the effect of a 6-week deep slow breathing program on pain, physical function, and heart rate changes in patients with lower extremity OA, deep slow breathing did not significantly alter patients' pain scores. These findings are consistent with our results and show that while DBE alone is enough to decrease anxiety after TKR surgery, it is not adequate for pain management.

Previous studies demonstrated that patients undergoing TKR experienced anxiety and depression before the operation (27-29). Duivenvoorden et al. (29) performed a prospective multi-center study evaluating the prevalence of anxiety and depression symptoms in TKR and THR patients preoperatively and at 3 and 12 months postoperatively. They reported a decrease in prevalence from 20.3% to 14.8% for anxiety symptoms and from 22.7% to 11.7% for depression symptoms in TKR patients. In previous studies, the relationship between TKR and depression was evaluated 6 weeks after surgery at the earliest (28-30). Studies with different sample groups demonstrated that breathing exercises reduced anxiety and depression (16,17,26). As our study is the first to measure the effect of DBE alone on anxiety and depression in TKR patients, no comparison could be made with other studies. However, contrary to the literature, DBE was not effective in reducing symptoms of depression in our study. This may be attributed to our relatively early assessment of depression symptoms (postoperative day 2).

LIMITATIONS

Small sample size may have caused the large standard deviations for all variables in this study. Another limitation is that because this study included patients who underwent TKR in one state hospital in the Central Anatolia region of Turkey, the results cannot be generalized for all TKR patients.

CONCLUSION

The results of our study demonstrated that DBE had no effect on pain and depression but reduced anxiety after TKR surgery. In addition, patients in the intervention group stated that when they performed DBE, they felt better, more at ease, calmer, and were effectively distracted by DBE. This study provides insight into the role of DBE as an intervention for pain, anxiety, and depression after TKR and may serve as a guide for providing quality care and helping patients with anxiety. DBE to reduce anxiety should be incorporated by nurses into routine plans of care for patients undergoing TKR. Further research using nursing interventions as an adjuvant to traditional pain management is needed.

As this is the first study evaluating the use of DBE as an intervention to cope with pain, anxiety, and depression after TKR, further studies of DBE with larger sample sizes are needed. Future studies evaluating and comparing long-term measurements (3 months, 6 months, 1 year) in larger sample sizes are recommended in order to determine the effects of DBE on anxiety and depression in TKR patients.

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Competing interests: The authors declare that they have no competing interest.

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Ethical approval: Cankiri Karatekin University (protocol no; 129-2019).

REFERENCES

1. Buyukyilmaz F, Asti T. The effect of relaxation techniques and back massage on pain and anxiety in Turkish total hip or knee arthroplasty patients. Pain Manag Nurs 2013;14:143-54.
2. Pasero C, McCaffery M. Orthopaedic postoperative pain management. Journal of Perianesthesia Nursing, 2007;22:160-71.
3. Sloan M, Premkumar A, Sheth NP. Projected volume of primary total joint arthroplasty in the u.s., 2014 to 2030. J Bone Joint Surg Am 2018;100:1455-60.

4. Ackerman IN, Bohensky MA, Zomer E, et al. The projected burden of primary total knee and hip replacement for osteoarthritis in Australia to the year 2030. BMC Musculoskelet Disord 2019;20:2-10.
5. Organisation for Economic Co-operation and Development. OECD Health Statistics 2017. http://dx.doi.org/10.1787/888933605255 access date 02.03.2020.
6. Wylde V, Dieppe P, Hewlett S, et al. Total knee replacement: Is it really an effective procedure for all?. Knee 2007;14: 417-23.
7. Chapman CR, Tuckett RP, Song CW. Pain and stress in a systems perspective: reciprocal neural, endocrine, and immune interactions. J Pain 2008;9:122-45.
8. Puolakka PA, Rorarius MG, Roviola M, et al. Persistent pain following knee arthroplasty. Eur J Anaesthesiol 2010;27:455-60.
9. Ouellet LL, Hodgins MH, Pond S, et al. Post-discharge telephone follow-up for orthopaedic surgical patient: a pilot study. J Orthopaedic Nurs 2003;7:87-93.
10. Bradshaw P, Hariharan S, Chen D. Does preoperative psychological status of patients affect postoperative pain? A prospective study from the Caribbean. Br J Pain 2016;10:108-15.
11. Lim YC, Yobas P, Chen HC. Efficacy of relaxation intervention on pain, self-efficacy, and stress-related variables in patients following total knee replacement surgery. Pain Manag Nurs 2014;15:888-96.
12. Gatlin CG, Shulmeister L. When medication is not enough: Nonpharmacologic management of pain. Clin J Oncol Nurs 2007;11:699-704.
13. Pellino TA, Gordon DB, Engelke ZK, et al. Use of nonpharmacologic interventions for pain and anxsiety after total hip and total knee arthroplasty. Orthop Nurs 2005;24:182-90.
14. Lehrer P, Karavidas MK, Lu SE, et al. Voluntarily produced increases in heart rate variability modulate autonomic effects of endotoxin induced systemic inflammation: an exploratory study. Applied Psychophysiology and Biofeedback 2010;35:303-15.
15. Busch V, Magerl W, Kern U, et al. The effect of deep and slow breathing on pain perception, autonomic activity, and mood processing-an experimental study. Pain Med 2012;13:215-28.
16. Hayama Y, Inoue T. The effects of deep breathing on 'tension-anxiety' and fatigue in cancer patients undergoing adjuvant chemotherapy. Complement Ther Clin Pract 2012;18:94-8.
17. Park E, Oh H, Kim T. The effects of relaxation breathing on procedural pain and anxiety during burn care. Burns 2013;39:1101-6.
18. Buyukyilmaz F, Asti T. Postoperative pain characteristics in Turkish orthopedic patients. Pain Manag Nurs 2010;11:76-84.
19. Larsen KL, Brilla LR, McLaughlin WL, et al. Effect of deep slow breathing on pain-related variables in osteoarthritis. Pain Res Manag 2019;3:1-9.
20. Fillingim RB, King CD, Ribeiro-Dasilva MC, et al. Sex, gender, and pain: a review of recent clinical and experimental findings. J Pain 2009;10:447-85.
21. Cleveland Clinic. (2018, September) Diaphragmatic Breathing. https://my.clevelandclinic.org/health/articles/9445-diaphragmatic-breathing access date 02.03.2020).
22. Kane RL, Bershadsky B, Rockwood T, et al. Visual Analog Scale pain reporting was standardized. J Clinical Epidemiology 2005;58:618-23.
23. Dogan N, Goris S, Demir H. Levels of pain and self-efficacy of individuals with osteoarthritis. Agri 2016; 28:25-31.
24. Aydemir O. Validity and reliability of Turkish verison of hospital anxiety and depression scale. Turkish J Psychiatry, 1997;8:280-7.
25. Chen YF, Huang XY, Chien CH, et al. The effectiveness of diaphragmatic breathing relaxation training for reducing anxiety. Perspect Psychiatr Care 2017;53: 329-36.
26. Valenza MC, Valenza-Peña G, Torres-Sănchez I, et al. Effectiveness of controlled breathing techniques on anxiety and depression in hospitalized patients with COPD: A randomized clinical trial. Respir Care 2014; 59:209-15.
27. Axford J, Butt A, Heron C, et al. Prevalence of anxiety and depression in osteoarthritis: use of the Hospital Anxiety and Depression Scale as a screening tool. Clin Rheumatol 2010;29:1277-83.
28. Ali A, Lindstrand A, Sundberg M, et al. Preoperative Anxiety and Depression Correlate With Dissatisfaction After Total Knee Arthroplasty: A Prospective Longitudinal Cohort Study of 186 Patients, With 4-Year Follow-Up. J Arthroplasty 2017;32:767-70.
29. Duivenvoorden T, Vissers MM, Verhaar JAN, et al. Anxiety and depressive symptoms before and after total hip and knee arthroplasty: a prospective multicentre study. Osteoarthritis Cartilage 2013;21: 1834-40.
30. Hirschmann MT, Testa E, Amsler F, et al. The unhappy total knee arthroplasty (TKA) patient: higher WOMAC and lower KSS in depressed patients prior and after TKA. Knee Surg Sports Traumatol Arthrosc 2013;21: 2405-11.