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An assessment of sleep quality in patients undergoing total knee arthroplasty before and after surgery

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Objective: The aim of this study was to compare the sleep quality of patients who underwent total knee arthroplasty before and after the surgery and analyze the effect of total knee arthroplasty on sleep quality.

Methods: The study included 42 patients (32 females, 10 males) who underwent total knee arthroplasty for primary knee osteoarthritis. For each patient the preoperative 1 day and postoperative 3 months results of Pittsburgh Sleep Quality Index (PSQI) and 100–mm visual analogue scale (VAS) were compared.

Results: The preoperative mean PSQI was 9. VAS score decreased in 97.6% of the patients, while sleep quality increased in 78.6%. 85.7% of the patients reported to have less episodes of pain related sleep disturbances. While both the PSQI and VAS improved after the surgery, there was no correlation between the parameters ($p>0.05$).

Conclusion: Our results suggested that total knee arthroplasty surgery relieves pain and improves sleep quality. The improvement in sleep quality does not appear to be related to pain relief.

Key words: Sleep quality; Pittsburgh sleep quality index; total knee arthroplasty.

Knee osteoarthritis (OA) is a common disease after the age of 65 years.[1] OA causes pain and disrupts the quality of life. Sleep quality is also one of the components of health-related quality of life like pain.[2-4] Total knee arthroplasty (TKA) is well accepted as a reliable and a suitable procedure to restore quality of life in osteoarthritic patients.[5] Although disturbance of sleep (night pain) is considered as one of the prerequisites for TKA, few studies evaluated the effect of arthroplasty on sleep quality.[6]

The aim of this study was to compare the sleep quality of the TKA patients before and after the surgery and to analyze the effect of total knee arthroplasty on sleep quality.

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Patients and methods

The prospective study included 42 patients (10 males and 32 females; mean age 65.8; range 52 to 82 years) who underwent TKA for primary knee osteoarthritis. Before surgery, 71% of participants were taking medication for another medical condition (Table 1). But none of the patients had the history of sleep disturbance or use of medication for sleep. The Pittsburgh Sleep Quality Index (PSQI)[7] which is an 18–item self–report questionnaire was used to assess sleep disturbance over the past month. The questionnaire gives seven component scores (C1-C7) that aims to measure the subjective quality of sleep (C1), sleep latency (C2), sleep duration (C3), habitual sleep efficiency (C4), sleep disturbances (C5), use of sleeping medication (C6), and daytime dysfunction (C7) over the last month at night in the older adults. Scoring of answers is based on a 0 to 3 scale, with "3" reflecting the negative extreme on the Likert Scale. A global sum of "5" or greater indicates a "poor" sleeper.

The greatest improvement in health-related quality of life was found to be more evident within the first three months after surgery in previous studies.[5,6,8] Therefore, data were obtained one day before surgery on bedside and again 3 months after TKA. Pain was also assessed one day before and 3 months after TKA, by means of a 100–mm visual analogue scale (VAS), one end of which represented no pain and the other end the worst pain imaginable.

Analysis of the data was performed by using SPSS for Windows, version 11.5 (SPSS Inc., Chicago, IL, United States). While, continuous data were presented as mean ± SD, median was used for ordinal variables. Wilcoxon signed rank test was used in the comparison of the preoperative and postoperative scores. Correlation between VAS and PSQI were analyzed with Spearman's correlation coefficients. The p values less than 0.05 were considered as statistically significant.

Table 1. Concomitant diseases.

Diseases	Number
Hypertension	19
Diabetes mellitus	7
Gastro–esophageal reflux	3
Epilepsy	1
Arrhythmia	1
Chronic obstructive lung disease	2
Migraine	1
Total	34

Table 2. Distribution of demographic and clinical characteristics of the patients.

Variables	n=42		
	n	%	Mean.±SD
Age			65.8±7.8
Age (range)	52-82		
Sex			
Male	10	23.8	
Female	32	76.2	
Concomitant illness	34	80.95	
Operation side			
Right	8	19.0	
Left	3	7.2	
Bilateral	31	73.8	

Results

Distributions of demographic and clinical characteristics are presented in Table 2. The overall change in the clinical status is presented in Table 3.

C1, C2, C3, C4, C5 and C7 subgroup of PSQI scores decreased significantly after surgery when compared with those before surgery ($p<0.05$). There was not a statistically significant change in C6 subgroup scores ($p=0.414$). In addition, the PSQI total scores decreased significantly after surgery compared with those before surgery ($p<0.001$) (Figure 1). All questions (except f and j) which formulate C5 of PSQI scores showed a statistically significant decrease ($p<0.05$). In addition, the

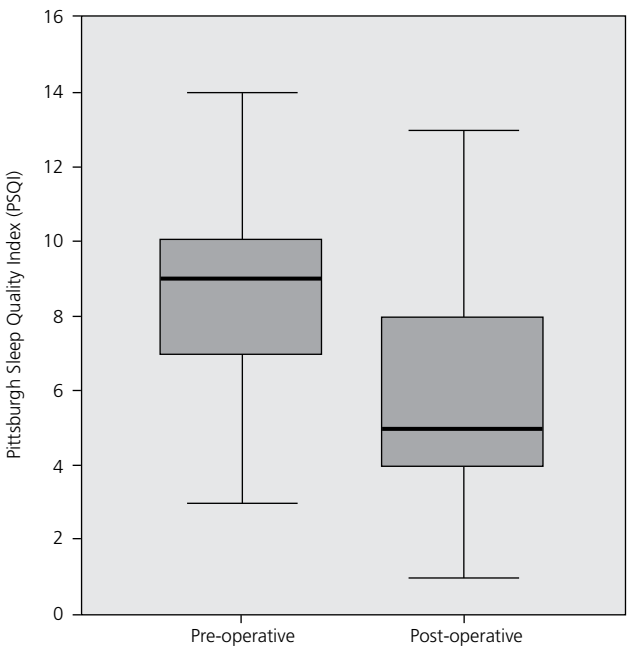

Fig. 1. Pre- and postoperative global PSQI scores.

Table 3. Changes in frequency distribution of cases according to VAS, total PSQI and subgroup scores.

	Participants who improved		Participants who deteriorated		Participants unchanged	
	n	%	n	%	n	%
C 1	22	52.4	3	7.1	17	40.5
C 2	19	45.2	4	9.5	19	45.2
Q 5a	22	52.4	3	7.1	17	40.5
C 3	19	45.2	5	11.9	18	42.9
C 4	20	47.6	7	16.7	15	35.7
C 5	18	42.9	1	2.4	23	54.8
Q 5b	14	33.3	4	9.5	24	57.1
Q 5c	13	31.0	4	9.5	25	59.5
Q 5d	9	21.4	1	2.4	32	76.2
Q 5e	9	21.4	4	9.5	29	69.0
Q 5f	15	35.7	6	14.3	21	50.0
Q 5g	17	40.5	6	14.3	19	45.2
Q 5h	14	33.3	2	4.8	26	61.9
Q 5i	36	85.7	2	4.8	4	9.5
Q 5j	5	11.9	4	9.5	33	78.6
C 6	1	2.4	2	4.8	39	92.9
C 7	20	47.6	1	2.4	21	50.0
PSQI Total	33	78.6	5	11.9	4	9.5
VAS	41	97.6	0	0.0	1	2.4

C: Component; Q: Question.

VAS scores decreased significantly after surgery compared with those before surgery ($p<0.001$) (Table 4) (Figure 2).

The change in VAS was significantly correlated with only the change in C2 subgroup scores of PSQI ($r=0.346$ and $p=0.025$). In other words, while the VAS score decreased, C2 subgroup score was also decreased (Table 5).

Table 4. Amount of changes in VAS total PSQI and subgroups scores after surgery.

	Pre–operative	Post–operative	p	Change
C 1	1 (1–2)	1 (0.75–1.0)	<0.001	-1 (-1–0)
C 2	2 (1–3)	2 (0–2)	0.010	0 (-1–0)
Q 5a	3 (1–3)	2 (0–2.25)	0.002	-1 (-1–0)
C 3	1 (0–1.25)	0 (0–1)	0.015	0 (-1–0)
C 4	1 (0–2)	0 (0–1)	0.011	0 (-1–0)
C 5	2 (2–2)	2 (1–2)	<0.001	0 (-1–0)
Q 5b	3 (3–3)	3 (2–3)	0.009	0 (-1–0)
Q 5c	3 (3–3)	3 (1–3)	0.011	0 (-1–0)
Q 5d	0 (0–1)	0 (0–1)	0.013	0 (0–0)
Q 5e	2 (0–3)	1 (0–3)	0.035	0 (0–0)
Q 5f	0 (0–2)	0 (0–1)	0.133	0 (-1–0)
Q 5g	0 (0–2.25)	0 (0–1)	0.009	0 (-1–0)
Q 5h	0 (0–2)	0 (0–1)	0.012	0 (-1–0)
Q 5i	3 (2–3)	1 (1–2)	<0.001	-1 (-2–-1)
Q 5j	0 (0–0)	0 (0–0)	0.417	0 (0–0)
C 6	0 (0–0)	0 (0–0)	0.414	0 (0–0)
C 7	1 (0–2)	1 (0–1)	<0.001	0 (-1–0)
PSQI Total	9 (7–10.25)	5 (4–8)	<0.001	-2.5 (-5–-1)
VAS	8 (6–8.5)	4 (2–4)	<0.001	-4 (-6–-4)

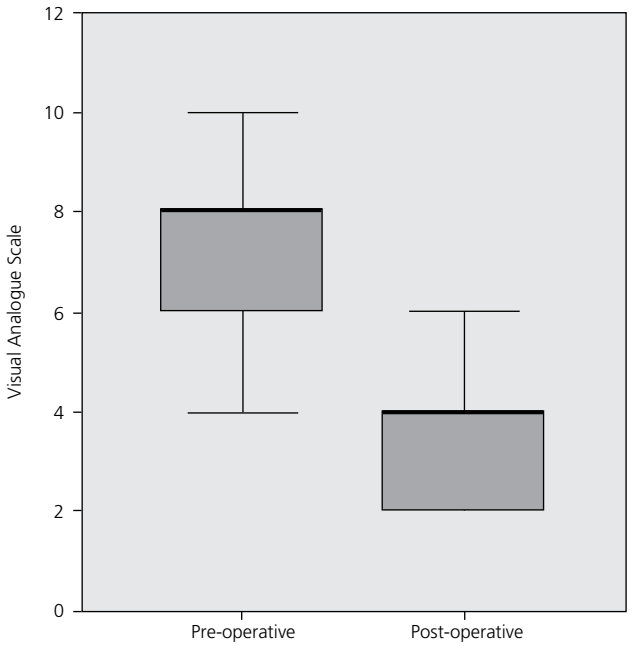

Fig. 2. Pre- and postoperative global VAS pain scores.

Table 5. Correlation coefficients and significance levels between changes in VAS, total PSQI and subgroup scores after surgery.

	Correlation coefficient (r)	p
C 1	0.177	0.262
C 2	0.346	0.025
Q 5a	0.402	0.008
C 3	0.242	0.123
C 4	–0.025	0.876
C 5	0.163	0.302
Q 5b	–0.040	0.804
Q 5c	–0.093	0.559
Q 5d	0.052	0.743
Q 5e	0.292	0.061
Q 5f	0.053	0.740
Q 5g	–0.129	0.417
Q 5h	0.146	0.357
Q 5i	0.225	0.152
Q 5j	–0.138	0.385
C 6	–0.029	0.856
C 7	0.203	0.197
PSQI Total	0.253	0.107

Discussion

Night pain is a common cause of sleep disturbance in patients with knee osteoarthritis.[3,4,9] We found preoperative mean PSQI as 9, which show that quality of sleep of these osteoarthritic patients was severely impaired.

After the operation, participants reported that they fell asleep more easily, their sleep duration was increased, they slept more efficiently, their sleep was interrupted less often and daytime dysfunction was decreased. As a result, 78.6% of the participants reported that their overall sleep quality was improved and 97.6% of them reported that their VAS score was improved after surgery. Furthermore, 85.7% of the patients reported that their sleep was interrupted by pain less often when compared with the period before surgery. These findings support the studies that arthroplasty not only alleviates pain but also contributes to life quality in osteoarthritic patients.[2,5,10]

Although both VAS and PSQI improved in the postoperative period, we could not find any statistically significant correlation between these two parameters. This may show that other parameters, like improvement in mobility and activities of daily life of those patients, rather than the pain itself, would play role on sleep quality in osteoarthritic patients. This point needs further investigations.

Although we conducted this study to assess the effect of TKA surgery on sleep quality, there are some other factors that would affect sleep parameters. Concomitant diseases such as gastro-esophageal reflux, chronic obstructive lung disease, migraine, diabetes or arrhythmia might also have adverse effects on sleep quality in our patients.[3,11,12] But regarding the fact that no changes in the status of the concomitant diseases occurred after the surgery and the patients evaluated their overall sleep quality when answering the questionnaire, we thought that the positive changes in sleep quality would be attributed mainly to the positive effects of TKA surgery.

Although we obtained good qualitative results in this study, there are some drawbacks of our study. In the present study, sleep quality was assessed with a questionnaire which is a subjective method and we did not use any supervised objective laboratory assessment. Previous studies[13,14] showed that the PSQI has high sensitivity and specificity for insomnia patients in comparison to healthy controls so it is a good, easy to handle, time–efficient and cost–effective measure to evaluate sleep disturbances. We believe that these features of PSQI will overcome this drawback and will transform this into an advantage.

In conclusion, TKA both alleviates the pain and improves the sleep quality of the patients and this improvement of sleep quality seems to be independent from the pain. Thus, TKA is still unique treatment modality for

both pain relief and increment in quality of life of the patients with end stage knee osteoarthritis.

Conflicts of Interest: No conflicts declared.

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