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ORIGINAL ARTICLE

The effect of the application of adductor canal block (ACB) and Infiltration of local anesthetic between the popliteal artery and capsule of the knee (IPACK) block to patients on postoperative recovery and sleep quality following total knee arthroplasty: a randomized, controlled study

Total diz artroplastisi sonrası hastalara adduktor ve IPACK blok uygulamasının ameliyat sonrası iyileşme ve uyku kalitesi üzerine etkisi: randomize, kontrollü bir çalışma"

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ABSTRACT

Aim: The adductor canal block (ACB) and IPACK (Infiltration of local anesthetic between the popliteal artery and capsule of the knee) block are motor protective blocks that provide effective analgesia and allow early ambulation. The aim of this study was to investigate the effect on postoperative recovery and sleep quality of patients applied with ACB and IPACK for total knee arthroplasty (TKA).
Material and Method: This prospective, double-blinded, randomized, controlled study included 80 patients who underwent unilateral TKA under spinal anesthesia. The patients were separated as those applied with ACB+IPACK (Group ACB+IPACK, n=40) and a control group (Group C, n=40). The primary outcome was the postoperative first-day quality of recovery scale (QoR-15). Secondary outcomes were postoperative first and second-day Timed-Up-and-Go (TUG) test and range of motion (ROM), the total amount of rescue opioid drugs required, pain scales at different time points in the first 48 hours postoperatively, sleep evaluation on the postoperative and 6 following nights, and evaluation of sleep quality for 1 month using the Pittsburgh Sleep Quality Index (PSQI).
Results: The QoR on postoperative days 1 and 7 were better in the ACB+ IPACK group than in the control group (p= 0.001, p= 0.002, respectively). On postoperative days 1 and 2, the TUG (p= 0.035, p= 0.019, respectively) and ROM (p=0.003, p=0.000) values were higher in the ACB+ IPCAK group. Postoperative opioid consumption was lower in the ACB+IPACK group (p= 0.012). The PSQI values at 1 month postoperatively were similar in both groups (p =0.095).
Conclusion: The study results demonstrated that ACB+IPACK applied with ultrasound for TKA postoperative analgesia provided effective analgesia, higher QoR and physical performance, and reduced postoperative opioid consumption. However, there was no effect on postoperative sleep quality.

Keywords: Lower extremity; Pain management; Postoperative pain; Knee arthroplasty

ÖZ

Amaç: Adduktor kanal bloğu (AKB) ve popliteal arter ile diz kapsülü arasındaki boşluk (IPACK) blokları motor koruyucu bloklardır, hızlı ambulasyon ve etkili analjezi sağlar. Bu çalışma total diz artroplastisi (TDA) için AKB ile IPACK uygulanan hastaların postoperatif iyileşme ve uyku kalitesine etkisini araştırmak için tasarlandı.
Gereç ve Yöntemler: Bu prospektif çift kör randomize kontrollü çalışmaya spinal anestezi altında tek taraflı TDA uygulanan 80 hasta dahil edildi. Hastalar AKB+IPACK uygulananlar (Grup ACB+IPACK, n=40) ve kontrol grubu (Grup C, n=40) olarak ayrıldı. Birincil sonuç, postoperatif 1. gün quality of recovery (QoR-15) ölçeğidir. İkincil sonuçlar; postoperatif 1 ve 2 gün Time up Go (TUG) ve range of motion (ROM) , kurtarıcı opioid ilaçların toplam miktarı ve ameliyat sonrası 48 saat içinde farklı zaman noktalarında ağrı skorları, postoperatif gece ve 6 gün uyku değerlendirmesi ve 1 ay uyku kalitesi indeksi degerledirmesi idi (PSQI).
Results: AKB+ IPACK grubu kontrol grubuna göre postoperatif 1. ve 7. gün iyileşme skorları daha iyiydi (sırasıyla; p= 0.001, p= 0.002). Postoperratif 1. ve 2. TUG (sırasıyla p= 0.035, p= 0.019) ve ROM (sırasıyla; p= 0.003, p= 0.000) değerleri AKB+ IPACK grubunda daha yüksekti. Postoperatif opiodi tüketim AKB+IPACK grubunda daha düşüktü (p= 0.012). Postoperatif 1 ay PSQI degerleri gruplar arası benzerdi (p =0.095).
Sonuç:n TDA'de postoperatif analjezi amacıyla uygulanan AKB+IPACK bloğu, daha yüksek QoR ve fiziksel performans sağlamakta, postoperatif opioid tüketimini azaltmakta ve etkin analjezi sağlamakta fakat postoperatif uyku kalitesi üzerine etkisiz kalmaktadır.

Anahtar Kelimeler: Alt ekstremite; Ağrı yönetimi; Postoperative ağrı; Diz artroplastisi

Introduction

If postoperative pain is not managed at a sufficient level, patients will experience severe pain (1). Postoperative sleep deterioration because of severe pain is one of the most frequently seen problems. The incidence of sleep disorder is as high as 60% in patients who have undergone total joint arthroplasty

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(1, 2). Postoperative sleep disorders cause stress and anxiety and have been shown to be associated with a prolonged hospital stay and worse clinical outcomes such as an increased risk of complications and low quality of recovery (3).

There is increasing use of peripheral nerve blocks together with neuroaxial block in total knee arthroplasty (TKA) (4). Postoperative moderate and severe pain is accepted as the main risk factor for these patients experiencing sleep disorders (4, 5). The application of peripheral nerve blocks together with neuroaxial anesthesia is an effective approach in postoperative analgesia. Especially by reducing postoperative opioid consumption and providing low pain scores, the anxiety levels of patients decrease (4, 6, 7). The application in particular of motor protective blocks such as the adductor canal block (ACB) and IPACK (Infiltration of local anesthetic between the Popliteal Artery and Capsule of the Knee) block has been reported to allow early postoperative mobilization and accelerate functional recovery (4). Another important advantage is that opioid consumption is significantly reduced after surgery (8, 9). The main postoperative aim in TKA is to provide a sufficient level of pain relief without affecting joint functions, and this will consequently provide functional independence and improve the quality of recovery.

Sleep disorders are seen in 50% of patients following TKA, and is a not clearly understood complication affecting the recovery of these patients (10). High opioid consumption can disrupt sleep quality (11) and poor sleep can cause hyperalgesia (12). There are insufficient studies in the literature on the subject of the effect of low opioid consumption and pain scores after TKA on postoperative recovery and sleep quality.

The aim of this study was to investigate the effect on postoperative 24-hour quality of recovery (QoR) of the application of ACB and IPACK blocks for TKA postoperative analgesia. A secondary aim was to determine the effect on postoperative pain scores, opioid consumption, and sleep quality. The study hypothesis was that the application of ACB and IPACK would improve the quality of postoperative recovery and the sleep quality of TKA patients.

Material and Method

Approval for this prospective, randomized, double-blinded study was granted by the Ethics Committee of Karamanoğlu Mehmetbey University Medical Faculty (decision no:02-2022/18, dated: 08.03.2022). All the study participants provided written informed consent in accordance with the principles of the 2013 Helsinki Declaration. The study included patients undergoing unilateral TKA between April 2022 and January 2023.

The study inclusion criteria were defined as patients aged 40-75 years, evaluated as American Society of Anesthesiologists (ASA) I-III, undergoing unilateral TKA under spinal anesthesia. Patients were excluded from the study if the operation was performed under general anesthesia if they were ASA IV, had a body mass index (BMI) of >40 kg/m2, had any neurological disease – including Parkinson's disease, if sedatives or hypnotics were used, if there was a history of alcohol abuse (>35 units per week), a history of surgery on the same knee, any other surgery within the last 6 months, liver or kidney failure, or allergy or intolerance to any of the drugs used in the study.

Randomization

Patient randomization was made at the ratio of 1:1 using the sealed envelope method by a specialist not included in the study. The patients were given a random number in a coded sealed envelope and assigned to either the ACB+IPACK group (n=40) or the control group (n=40) immediately before the operation. The drugs were prepared by a nurse not blinded to the groups and the blocks were performed by a specialist blinded to the patient groups. The postoperative pain evaluations, functional tests, questionnaires, and data collection were performed by nurses, specialists, and the patients, all of whom were blinded to the study groups.

Multimodal analgesia

The multimodal analgesia was planned as preoperative 1000mg paracetamol and 4mg dexamethasone to be administered intravenously (IV). Esomeprazole at 4mg IV was given as gastric protection. No opioids or benzodiazepines were given to the patients on the morning of the operation. For the spinal anesthesia, the patients were placed in the sitting position then 2.5-3ml 0.5% hyperbaric bupivacaine was injected to the L3-4 or L4-5 intervertebral space. The same standard postoperative analgesia protocol was applied to all the patients. Paracetamol 1000mg 3 times a daily and dexketoprofen 50 mg twice daily were routinely administered IV. Patients with pain severity of >4 on the numerical rating scale were administered 5mg oral tablet of oxycodone. It was planned to discharge patients according to the standard discharge protocol.

Application of the ACB and IPACK blocks

For the ACB block, the patient was positioned supine and an ultrasound linear probe (13-16 MHz) was advanced from cephalic to caudal. The adductor canal was identified at the mid-level of the thigh. After identification of the femoral artery short axis, a 22-gauge 100ml needle (Braun® Stimuplex) was advanced from lateral to medial using the in-plane technique. After obtaining negative aspiration, a periarterial spread of 20ml 0.25% bupivacaine was observed.

For the IPACK application, a low-frequency (3-5 MHz) ultrasound probe was used. With the patient positioned supine, the leg was turned slightly outwards and the ultrasound probe was placed on the medial knee joint to identify the femoral condyle and was then advanced towards the posterior. The popliteal artery was identified and a 22-gauge 100ml needle was advanced from lateral to medial using the in-plane technique. When the needle tip was seen to be between the popliteal artery and the femoral condyle, 20ml 0.25% bupivacaine was injected to the posterior section of the condyles, and dissemination of the local anesthesia was observed.

For the patients in the control group, sham blocks were performed. In the same positions as for the ACB and IPACK blocks, 20ml physiological saline was administered under ultrasound guidance.

Outcome measurements

As the primary outcome measurement, the postoperative 24-hour QoR-15 was evaluated. The QoR-15 scale, which has been validated in Turkish, is a questionnaire that is used to evaluate postoperative quality of recovery. The total score of the 15 parameters on the scale ranges from 0 to 150 (13).

The secondary outcome measures were the postoperative 7-day QoR-15 score, static and dynamic pain severity scores on the Numerical Rating Scale (NRS) measured at 4, 6, 8, 12, 24, and 48 hours postoperatively, 0-48 hours oral opioid consumption (reported as first 48-hour morphine equivalent), and the postoperative first and second-day Timed-Up-and-Go (TUG) test and range of motion (ROM) values. The TUG test (measured in seconds) requires the patient to get up from the chair, walk 3 meters, turn back to the chair, and sit down. A standard goniometer measured active knee flexion and extension ROM in the supine position. To evaluate sleep quality a Likert scale ranging from 1= worst to 5= best was applied on the postoperative and 6 following nights, and at 1 month, the Pittsburgh Sleep Quality Index (PSQI) was used. The PSQI consists of 7 parameters of sleep quality, sleep effectiveness, sleep latency, sleep duration, sleep disruption, daytime function disruption, and the use of sleep medication. Each parameter is scored from 0 to 3 points (0= very good, 3 = very bad) to give a global score in the range of 0 to 21 points, with a higher score indicating poor sleep quality.

Statistical analysis

For the QoR-15 scores after the perioperative applications, the minimal clinically significant difference was accepted as 8 points (14). Following a pre-study with 10 patients, the mean 24-hour QoR-15 value was 110±14. It was assumed that an increase of 8 points in the QoR score would be significant. The Cohen effect size was calculated as 0.571. The sample size required for the study was calculated using G*Power analysis software. It was determined that for a=0.05 error minimum and 80% power (1-β =0.10), a minimum number of 78 patients should be included (39 in each group). Considering potential losses for any reason of 10%, a total of 84 patients were included (42 in each group).

Data obtained in the study were analyzed statistically using IBM SPSS vn. 26 software. Conformity of the data to normal distribution was assessed with the Shapiro-Wilk test. The groups were compared using the Student's t-test or the Mann-Whitney U-test depending on the data distribution. Descriptive statistics were presented as mean ± standard deviation or median and interquartile range (25th and 75th percentiles) values. Ratios were compared using the Chi-square test and categorical variables with Fisher's Exact test. The level of statistical significance was set at $p<0.05$.

Results

A total of 90 patients were initially screened for eligibility for the study. Of these, 6 were excluded for various reasons and a further 4 were excluded as the surgery was converted to general anesthesia. Analysis was made of 80 patients, as 40 in the ACB+IPACK group and 40 in the control group (Figure 1). In the preoperative evaluations, the demographic data, static and dynamic NRS scores, and the PSQI values were similar in both groups (Table 1).

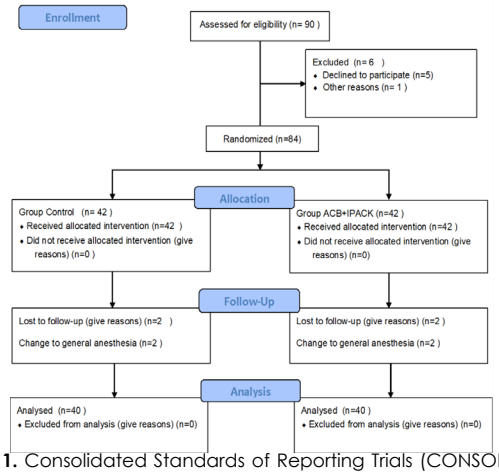

Figure 1. Consolidated Standards of Reporting Trials (CONSORT) flow diagram. ACB, adductor canal block; IPACK, the infiltration between the popliteal artery and capsule of the knee block

Table 1. Comparison of patient characteristics and intraoperative data between study groups

		Control (n=40)	ACB+IPACK (n=40)	P values
Sex	Female	26 (65%)	22 (55%)	0.361*
	Male	14 (35%)	18 (45%)	
Age (years)		68 (6.61)	67.27(7.90)	0.658†
ASA	1	8 (20%)	8 (20%)	0.378*
	2	25 (62.5%9)	22 (55%)	
	3	7 (17.5%)	10 (25%)	
BMI (kg/m²)		30.80 (8.51))	29.70 (2.91)	0.443ᵇ
Surgical side	Right	24 (60%)	26 (65%)	0.644*
	Left	16 (40%)	14 (35%)	
Duration of anesthesia, min		89.50 (8.47)	92.62 (6.38)	0.066†
Surgical time, min		62.35 (6.75)	61.17 (6.93)	0.445†
Preoperative NRSstatik		2.8 (1.12)	2.85 (0.62)	0.859†
Preoperative NRSdinamik		6.72(1.28)	6.62(1.29)	0.729†
Preopretaive PSQI		6.52 (2.87)	6.42 (2.679	0.873†

*Chi-Square test with n (%), † Student's t-test with mean (SD),
ACB, adductor canal block; IPACK, the infiltration between the popliteal artery and capsule of the knee block; ASA, American Society of Anesthesiologists; NRS, numeric rating scale; BMI, body mass index; SD, standard deviation; PSQI, Pittsburg Sleep Quality Index

The postoperative 1 and 7-day QoR-15 scores were statistically significantly lower in the control group (114.90 ± 10.41, 143.95 ± 2.15) than in the ACB+IPACK group (122.90 ± 11.07, 145.45 ± 2.12) (p= 0.001, p= 0.002, respectively). The postoperative 1 and 2-day TUG values were statistically significantly higher in the ACB+IPACK group (70.90 ± 19.89, 35.52 ± 8.47) than in the control group (80.97 ± 22.15, 42.37 ± 15.97) (p= 0.035, p= 0.019, respectively). The postoperative 1 and 2-day ROM values were statistically significantly higher in the ACB+IPACK group (89.67 ± 8.38, 101.77 ± 4.72) than in the control group (84.50 ± 8.38, 96.72 ± 6.45) (p=0.003, p=0.000, respectively) (Table 2).

Table 2. Comparison of postoperative quality of recovery (QoR)-15, patient satisfaction, mobilization time and complications

		Control (n = 40)	ACB+ IPACK (n = 40)	*P* values
Mobilization time (hour)		7.50 ± 1.50	7.17 ± 1.83	0.389
QoR-15 Score	Preopera-tive	140.20 ± 2.46	141.37 ± 2.91	0.175
TUG	Postop. 1 day	114.90 ± 10.41	122.90 ± 11.07	0.001*
	Postop. 7 day	143.95 ± 2.15	145.45 ± 2.12	0.002*
	Preopera-tive	19.77 ± 2.52	20.50 ± 1.60	0.129
	Postop. 1 day	80.97 ± 22.15	70.90 ± 19.89	0.035*
	Postop. 2 day	42.37 ± 15.97	35.52 ± 8.47	0.019*
ROM	Preopera-tive	111.25 ± 5.81	110.92 ± 5.04	0.790
	Postop. 1 day	84.50 ± 8.38	89.67 ± 8.38	0.003*
	Postop. 2 day	96.72 ± 6.45	101.77 ± 4.72	0.000*
Nause	Yes	13 (32.5%)	9 (22.5%)	
	No	27 (67.5%)	31 (77.5%)	0.453 †
Vomiting	Yes	5 (12.5%)	5 (12.5%)	1.00†
	No	35 (87.5%)	35 (87.5%)	

ACB, adductor canal block; IPACK, the infiltration between the popliteal artery and capsule of the knee block; ROM, range of motion; TUG, time up-and-go test
Values are presented as mean ± SD. . †Chi-square test with n (%). * P value < 0.05; statistically significant

The postoperative 4 and 6-hour static NRS values were determined to be statistically significantly lower in the ACB+IPACK group (0.00 ± 0.00, 1.05 ± 0.77) than in the control group (0.35 ± 0.53, 1.90 ± 0.77) (p= 0.000). The postoperative 4, 6, and 8-hour dynamic NRS values were determined to be statistically significantly lower in the ACB+IPACK group (0.37 ± 0.66, 2.00 ± 1.10, 3.65 ± 1.07) than in the control group (1.22 ± 1.09, 3.40 ± 1.23, 4.55 ± 1.17) (p=0.000, p=0.000, p=0.001, respectively) (Table 3).

Table 3. Comparison of NRS scores measured statically and dynamically in the study groups

		Control (n=40)	ACB+IPACK (n=40)	*P* values	95 % CI
NRS static					
	4 hr	0.35 ± 0.53	0.00 ± 0.00	0.000*	+ 0.18, + 0.51
	6 hr	1.90 ± 0.77	1.05 ± 0.77	0.000*	+ 0.54, + 1.15
	8 hr	2.55 ± 0.71	2.32 ± 0.94	0.233	- 0.14, + 0.59
	12 hr	2.40 ± 0.63	2.35 ± O.69	0.738	- 0.24, + 0.34
	24 hr	1.97 ± 0.61	2.02 ± 0.80	0.756	- 0.36, + 0.26
	48 hr	1.17 ± 0.38	1.20 ± 0.60	0.827	- 0.25, + 0.20
NRS dinamic					
	4 hr	1.22 ± 1.09	0.37 ± 0.66	0.000*	+ 0.44, + 1.25
	6 hr	3.40 ± 1.23	2.00 ± 1.10	0.000*	+ 0.87, + 1.92
	8 hr	4.55 ± 1.17	3.65 ± 1.07	0.001*	+ 0.39, +1.40
	12 hr	4.00 ± 1.03	3.97 ± 1.20	0.921	- 0.47, + 0.52
	24 hr	3.22 ± 0.83	3.15 ± 1.02	0.721	- 0.34, + 0.49
	48 hr	2.35 ± 0.53	2.25 ± 0.66	0.463	- 1,69, + 0.36

NRS, numeric rating scale; ACB adductor canal block, IPACK the infiltration between the popliteal artery and capsule of the knee block
Values are presented as mean ± SD or Confidence Interval (95% CI).* P value < 0.05; statistically significant

The time to first opioid requirement postoperatively was statistically significantly longer in the ACB+IPACK group (9.90 ± 2.53) than in the control group (7.52 ± 2.14) (p=0.000). The opioid consumption between postoperative 0-6, 6-12, and 0-48 hours was statistically significantly lower in the ACB+IPACK group (0 [0-0], 7.5 (0-0], 22.5 [15-30]) than in the control group (0[0-7.5)], 7.5 [7.5-15], 22.5 [22.5-30]) (p= 0.019, p =0.002, p= 0.012, respectively) (Table 4).

Table 4. Comparison of the amount of postoperative analgesia needed between study groups at 0-12, 12-24, 24-48, and 0-48 hour time intervals. Oral Morphine equivalent daily dose.

	Control	ACB+ IPACK	*P* values
Time to first opioid requirement (hour)	7.52 ± 2.14	9.90 ± 2.53	0.000*
The need for analgesia			
0- 6 h	0 (0-7.5)	0 (0-0)	0.019*
6-12 h	7.5 (7.5-15)	7.5 (0-0)	0.002*
12-24 h	7.5 (7.5-7.5)	7.5 (7.5-11.25)	0.078
24-48 h	7.5 (0-7.5)	0 (0-7.5)	0.120
0-48 h	22.5 (22.5-30)	22.5 (15-30)	0.012*

ACB, adductor canal block; IPACK, the infiltration between the popliteal artery and capsule of the knee block
Values are presented as mean ± SD or Mann-Whitney U test with median (Q1, Q3),).* P value < 0.05; statistically significant

In the evaluation of sleep quality on the postoperative night and first day, it was significantly better in the ACB+IPACK group (3.5 [3-4], 4[3-4]) than in the control group (3[2-4], 3 [3-4]) (p = 0.008, p= 0.018, respectively) (Table 5). According to the postoperative 1-month PSQI values, the sleep effectiveness and disturbed sleep values were significantly better in the ACB+IPACK group (0.40 ±0.49, 0.17 1±0.38) than in the control group (0.72 ±0.45, 0.47 ±0.50) (p = 0.003, p=0.004, respectively). The postoperative 1-month total PSQI values were similar in the ACB+ IPACK group (3.77 ± 1.64 and) the control group (4.37 ± 1.53) (p=0.095) (Table 5).

Table 5. Comparison of night of postoperative and postoperative 6-day sleep disturbance scores between research groups

	Control	ACB+IPACK	P values
Sleep			
Night of postoperative	3 (2-4)	3.5 (3-4)	< 0.008*
Day 1	3 (3-4)	4 (3-4)	0.018*
Day 2	4 (3-4)	4 (4-5)	0.087
Day 3	4 (4-5)	5 (4-5)	0.448
Day 4	5 (4-5)	5 (5-5)	0.287
Day 5	5 (5-5)	5 (5-5)	0.559
Day 6	5 (5-5)	5 (5-5)	0.559

ACB, adductor canal block; IPACK, the infiltration between the popliteal artery and capsule of the knee block;
Mann-Whitney U test with median (interquartile range: Q1- Q3). * P value < 0.05; statistically significant

Table 6. Comparison of postoperative 1 month PSQI score between research groups

	Control	ACB+IPACK	*P* values
Sleep			
Quality	1.10 (0.44)	0.92 (0.57)	0.130
Latency	1.05 (0.31)	1.17 (0.38)	0.117
Duration	0.97 (0.42)	0.97 (0.35)	1.000
Efficiency	0.72 (0.45)	0.40 (0.49)	0.003*
Disturbing	0.47 (0.50)	0.17 (0.38)	0.004 *
Tiredness	0.12 (0.33)	0.07 (0.26)	0.462
Medication	0.00 (0.00)	0.25 (0.15)	0.320
Total PSQI	4.37 (1.53)	3.77 (1.64)	0.095

ACB adduvctor canal block, IPACK the infiltration between the popliteal artery and capsule of the knee block; PSQI, Pittsburg Sleep Quality Index
Student's t-test with mean (SD), * P value < 0.05; statistically significant

Discussion

The results of this randomized, double-blinded study demonstrated that preoperative application of ACB and IPACK blocks to patients undergoing TKA provided better recovery on postoperative days 1 and 7. A significant improvement was obtained especially in the postoperative ROM and TUG values. In addition, effective analgesia was provided according to the 0-6-hour static and 0-8-hour dynamic NRS values, and lower opioid consumption was achieved at 0-12 hours and 0-48 hours. In respect of sleep quality evaluated at 1 month postoperatively, it was seen that the ACB and IPACK block applications were more effective in respect of sleep effectiveness and disrupted sleep, but the total sleep quality results were similar in both groups.

Within the postoperative recovery protocols (ERAS), postoperative pain management is of great importance in respect of early recovery and patient satisfaction (15). In the ERAS protocols, it is aimed for multimodal analgesia to reach the highest level and for complications caused by drugs to be reduced to the minimum. Therefore, the use of regional blocks as a part of multimodal analgesia has become more widespread. Local anesthesia infiltration (LIA), and femoral, adductor, and IPACK blocks are performed as a part of multimodal analgesia in TKA (6, 8, 16, 17). Luo et al. (17) showed that the combination of ACB and LIA was more effective on the criteria of postoperative ROM, sleep, and recovery. It was also reported to be effective in postoperative analgesia control. In another study, it was reported that patients applied with the combination of ACB+IPACK and dexamethasone had lower morphine consumption in

the first 72 hours postoperatively, and better QoR-15 results were obtained on postoperatively days 1 and 3. In addition to providing effective analgesia, another advantage of the ACB+IPACK block seems to be that muscle strength is less affected (18). Therefore, the motor protective effect of the ACB+IPACK block is at a high level (17, 18).

In the current study, the patients applied with the ACB+IPACK block had higher ROM and TUG Values on postoperative days 1 and 2, and the 8-hour NRS values decreased significantly. This resulted in postoperative 48-hour lower opioid consumption. Consequently, higher QoR-15 values were obtained on postoperative days 1 and 7 with ACB+IPACK block. The postoperative day 1 QoR values obtained in this study are consistent with the literature. A motor protective effect and effective analgesia were provided by the ACB+IPACK block application and it was considered that the quality of postoperative recovery increased as a result of this.

Sleep disorders are multifactorial but an inadequate approach to pain management after TKA causes disturbing pain in a third of patients, especially in the first 3 months, and this diminishes the sleep quality of patients (19). In a previous study, it was hypothesized that poor sleep increases the perception of pain. Disrupted sleep at 1 month postoperatively was examined as a mediator of the relationship between pain at 1 month postoperatively and functional limitations after 3 months. It was concluded that interventions targeting sleep disorders and sufficient sleep in the postoperative recovery process could increase the rate and quality of recovery (12). In addition, a high amount of opioid consumption to manage severe postoperative pain can cause sleep deprivation (11). In a study of sleep disorders after TKA, Fatah et al. emphasized the need for multimodal analgesia to improve sleep disorders and patient satisfaction. However, in another study, sleep quality disappeared on the first night despite multimodal analgesia with spinal anesthesia (11).

In the evaluation of sleep on the postoperative and following night in the current study, it was seen that the patients in the ACB+IPACK group experienced better quality sleep. This was attributed to the low 12-hour NRS values and lower opioid consumption in 0-48 hours of these patients. However, in the 1-month PSQI evaluation, the results were similar in both groups. Among the reasons for this, it must not be ignored that many factors can affect sleep disorders.

One of the limitations of this study is that the reasons for sleep disorders are multifactorial. Functional scores such as the Knee Society Score, the Western Ontario and McMaster Universities Osteoarthritis Index, or the Short-Form-36, which would provide more information about sleep disorders after TKA, were not applied in this study.

In conclusion, the application of ACB and IPACK decreased the postoperative NRS values and opioid consumption in TKA patients. Consequently, better 1 and 7-day QoR results were obtained by the patients. However, no significant improvement in sleep quality was observed in the patient group applied with ACB and IPACK.

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Conflicts of interest

No potential conflict of interest any financial or non-financial interest was reported by the authors.

Author contributions TE

Project administration, Conceptualization, Data curation, Investigation, Methodology, Writing – review & editing.

MK: Conceptualization, Data curation, Investigation, Methodology, Writing – review & editing.

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Data Availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request

Ethical approval

The study was approved by the Ethics Committee of Karamanoğlu Mehmetbey University Medical Faculty (decision no:02-2022/18, dated: 08.03.2022)

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