

Does sleep disturbance and quality of life improve after arthroscopic rotator cuff repair?

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Abstract

Aim: The primary aim of this study was to investigate sleep disturbance preoperatively and postoperatively in patients with rotator cuff tear (RCT).

Material and Methods: A total of 69 patients who were treated with full arthroscopic intervention for RCT were included in this study. Sleep disturbance and shoulder functions were analyzed. The outcome measurements were Pittsburgh Sleep Quality Index (PSQI), American Shoulder and Elbow Surgeons (ASES) scale, and Constant and Murley Shoulder Score (CSS). These measurements were performed preoperatively and after a minimum 2 years of follow-up.

Results: This study included a total of 69 patients comprising 32 men and 37 women with a median age of 54 (35–77) years. The mean follow-up period was 29.8 (range, 24–41) months. Preoperative sleep disturbance was reported in 92.7% of patients (n, 64/69), with a mean (\pm standard deviation [SD]) PSQI score of 10 (\pm 3.5), while 37.7% of patients (n, 26/69), with a mean (\pm SD) PSQI score of 5.4 (\pm 2.8), had postoperative sleep disturbance. Sleep disturbance significantly improved in the postoperative period ($p < 0.0001$). The ASES score and CSS were significantly improved after the follow-up period ($p < 0.0001$, $p < 0.0001$). Sleep improvement was poor in massive tear compared with other tear types. The coexistence of diabetes and hypertension (n=12) was an independent factor for sleep disturbance ($p = 0.012$).

Conclusion: Sleep disturbance in patients with RCT improved after arthroscopic repair. Sleep quality improvement was correlated with ASES score and CSS. Massive RCT and concomitant DM and HT negatively affected sleep improvement.

Keywords: Rotator Cuff Tear; Sleep Disturbance; Arthroscopy; Shoulder Functions.

INTRODUCTION

Rotator cuff injury is the most common shoulder disorder for which patients seek treatment (1,2). Rotator cuff tear (RCT) usually leads to shoulder pain, weakness, stiffness, and motion limitations (3). Beside these physical impairments, sleep disturbance is a major complaint of patients with RCT (4-6). Nocturnal pain is known as a major cause of sleep disturbance in these patients (6). Nocturnal pain, insomnia, and lack of sleep had been shown to be related to rotator cuff pathologies in the affected shoulder (4,6). Poor or inadequate sleep and pain often cause the patient to seek treatment (7).

Surgical treatment is usually required in patients who have persistent shoulder symptoms and functional impairment after conservative treatment (2,8). Fully arthroscopic interventions are generally considered to be the standard of care for most tears (2,8,9). Arthroscopic RCT repair generally improve shoulder function and decrease pain

(2,8,9,10). However, pain decrement and shoulder function improvement may not lead to sleep recovery (7). Sleep improvement after RCT repair was reported in a few studies (7,11,12,13,14). However, sleep disturbance was still demonstrated in 41% of patients in a recent study (13). Prolonged narcotic analgesic use was also shown to negatively affect sleep disturbance in these studies (7, 13). Nevertheless, there were study limitations such as short follow-up period, small patient numbers, and limited information about sleep quality and daily life activity.

There was no consensus on sleep improvement after RCT repair. The primary purpose of this study was to investigate sleep disturbance preoperatively and postoperatively in patients with RCT. The secondary aim was to assess factors related to sleep disturbance in patients with RCT. Our first hypothesis was that sleep disturbance improved after a 2-year follow-up. The second hypothesis was that chronic diseases rather than tear size negatively affected sleep disturbance.

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MATERIAL and METHODS

We retrospectively reviewed the records of patient with RCT in Sakarya University Training and Research Hospital between May 2015 and December 2016. At this time, 95 patients were surgically treated for RCT, of whom 69 patients met the inclusion criteria of this study. The inclusion criteria were (1) full thickness RCT treated with arthroscopic rotator cuff repair and (2) minimum of 24 months follow-up. The exclusion criteria were (1) previous shoulder surgery, (2) concurrent adhesive capsulitis, (3) history of psychiatric disorders, and (3) history of treatment for sleep disturbances. One patient died in a car accident and was excluded from this study.

The study protocol was approved by the ethics committee of Sakarya University Faculty of Medicine (reference number 71522473/050.01.04/342).

The outcome measurements of this study were the Pittsburgh Sleep Quality Index (PSQI), American Shoulder and Elbow Surgeons (ASES) scale, and Constant and Murley Shoulder Score (CSS). These measurements were performed preoperatively and after a minimum of 2 years follow-up. Demographic data of patients such as age, sex, affected side, chronic disease, body mass index (BMI), nicotine use, and narcotic use were also collected and analyzed.

All arthroscopic rotator cuff repairs were performed by one skilled orthopedic surgeon. All patients were operated under general anesthesia with additional interscalene block. The tear size (small <1 cm, medium 1–3 cm, large 3–5 cm, and massive >5 cm), repair type (single or double row), subacromial decompression, additional biceps intervention, and intraoperative complications were recorded postoperatively.

Postoperative pain management included dexketoprofen (50 mg at 8-h intervals) and acetaminophen (500 mg, every 6 h as needed) in the first 48 h. Naproxen (550 mg, twice per day as needed) and acetaminophen (500 mg, every 8 h as needed) were used in oral form for pain relief after discharge from the hospital.

A similar postoperative rehabilitation protocol was applied to patients. A shoulder sling with abduction pillow was used for immobilization in 6 postoperative weeks. Pendulum exercises were started as soon as possible according to patient tolerability. Passive range of motion was started after 6 weeks, and active shoulder motion was allowed after 8 weeks. Progressive resistive exercises were started 3 months postoperatively. Free movement in daily activities was allowed after 6 months.

Study Measurements

Outcome measurements were collected and scored by one research coordinator. Patient outcome scores were recorded preoperatively and postoperatively.

PSQI

The PSQI is designed to measure sleep quality (15). It is

a valid and standardized measurement (7). The PSQI has been generally used in evaluating sleep quality in clinical practice. Patients answered and completed a 19-question survey, from which 7 component scores are obtained: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disorder, sleep medication use, and daytime functional disorder. This questionnaire reported scores from 0 to 21 points. The higher score indicated worsening sleep dysfunction. A total score >5 was indicative of poor sleep quality.

ASES Scale

The ASES scale is a patient self-reported, validated, reliable, and responsive measure of shoulder function and pain (16, 17). Fifty percent of the score is represented by pain from 0 to 10 with 0 representing “no pain at all” and 10 representing “pain as bad as it can be.” The remaining 50% of the score is obtained from 10 questions that assess sports participation and activities of daily living. The ASES score ranges from 0 (debilitating pain, poor function) to 100 (no pain, normal function).

CSS

The CSS is a comprehensive and comparable assessment of shoulder function (12,18). This patient and clinician completed survey contains four subscales: pain (15 points), activities of daily living (20 points), strength (25 points), and range of motion: forward elevation, external rotation, abduction, and internal rotation of the shoulder (40 points). The higher score presents higher quality of function.

Statistical Analysis

Statistical analysis was performed with IBM SPSS for Windows version 21.0. Numerical variables were summarized as mean, standard deviation, median, min-max, and interquartile range. Categorical variables were indicated by number and percentage. The normal distribution of numerical variables by Shapiro-Wilk and Kolmogorov-Smirnov tests was examined. To determine differences between two dependent groups in terms of numerical variables, since the parametric test assumptions could not be obtained, the Wilcoxon signed-rank test was used. The level of statistical significance was determined as P-value <0.05.

RESULTS

This study included a total of 69 patients comprising 32 men and 37 women with a median age of 54 (35–77) years. Patient demographics are presented in Table 1. Preoperative sleep disturbance was reported in 92.7% of patients (n, 64/69), with a mean (\pm SD) PSQI score of 10 (\pm 3.5) (range, 5–21). After a mean follow-up period of 29.8 months (range, 24–41), sleep disturbance was reported in 37.7% of patients (n, 26/69), with a mean (\pm SD) PSQI score of 5.4 (\pm 2.8) (range, 1–15) (Figure 1). Sleep disturbance was significantly improved in the postoperative period (p <0.0001).

The ASES score was significantly improved after follow-up ($p < 0.0001$). The mean CSS was 26.4 preoperatively but improved to 88.5 postoperatively. This improvement in CSS was statistically significant ($p < 0.0001$). Preoperative

and postoperative shoulder measurements are shown in Table 2.

Correlation between sleep quality and shoulder scores are shown in Figure 2.

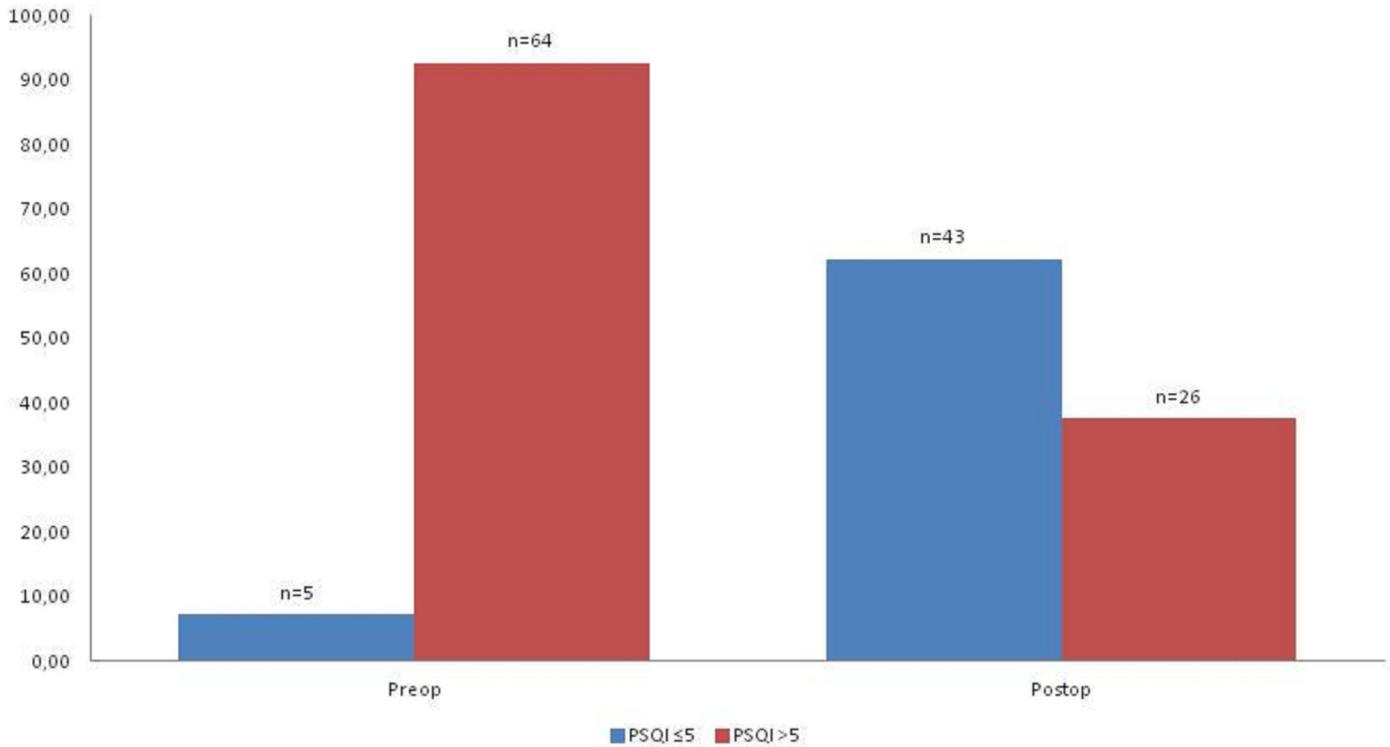


Figure 1. Preoperative and postoperative sleep disturbance. n=number; PSQI=Pittsburgh Sleep Quality Index

Sleep quality and shoulder scores

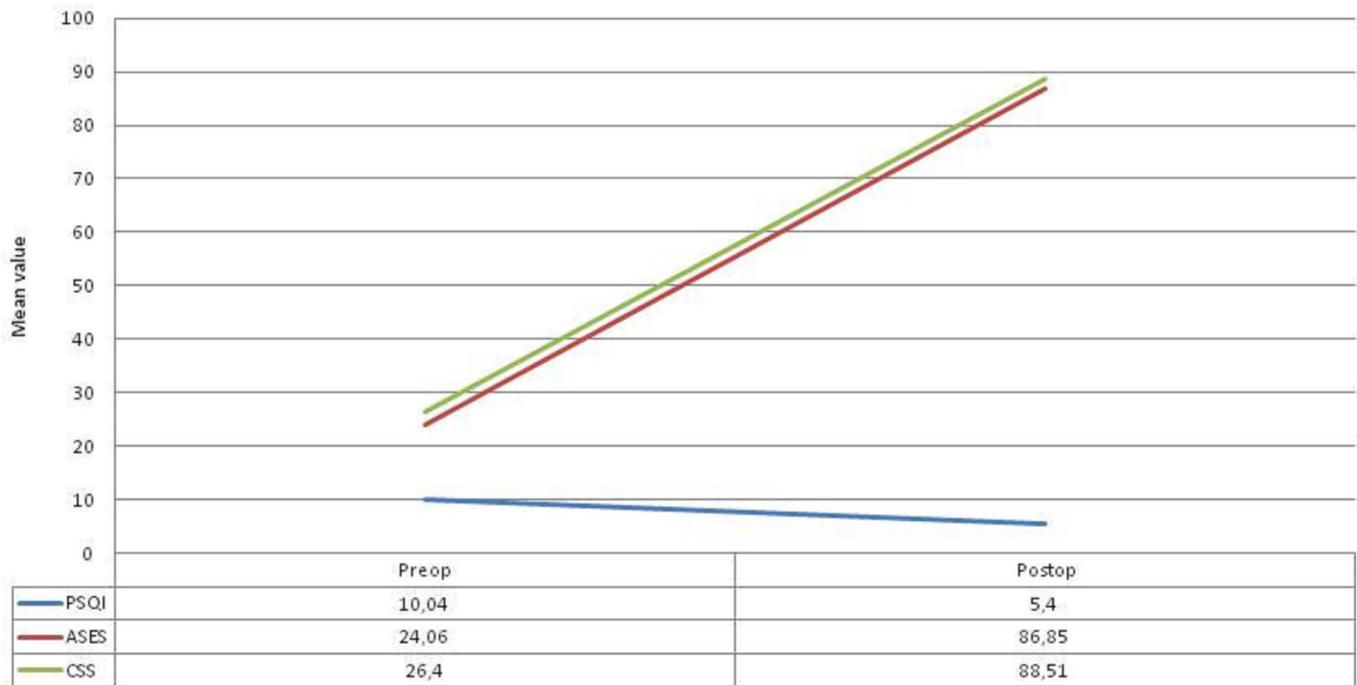


Figure 2. Correlation between sleep quality and shoulder scores

According to the RCT type, 25 patients had small tear, 23 patients medium tear, 13 patients large tear, and 8 patients massive tear. Sleep disturbance was significantly improved in postoperative measurement for all tear types (Table 3). Although PSQI score was significantly higher postoperatively for all tear types, improvement was poor for massive tears compared to other types ($p=0.02$). The mean ASES score and CSS were significantly higher in postoperative measurements of all tear types (Table 3).

Table 1. Demographic information of patients (n=69)

Sex, male/female, n*	32/37
Age, years, mean (range)	54.2 (35–77)
Body mass index, mean (range)	30.4 (20–44)
Smoker, n (%)	19 (27.5)
Operated side, right/left	46/23
Chronic disease, DM/HT/CAD/asthma*, n	13/26/2/3 (33 patients had chronic diseases)
Work, laborer/retired/housewife, n	27/10/32

*n, number; DM, diabetes mellitus; HT, hypertension; CAD, coronary artery disease

Table 2. Sleep disturbance and shoulder scores in preoperative and postoperative period

	Preoperative mean±SD (range)	Postoperative mean±SD (range)	P-value
PSQI	10.04±3.46 (5–21)	5.40±2.79 (1–15)	0.0001
ASES	24.06±8.84 (10–55.6)	86.85±9.80 (38.3–100)	0.0001
CSS	26.40±7.89 (10–45)	88.51±8.47 (53–100)	0.0001

Table 3. Sleep disturbance and shoulder scores according to rotator cuff tear type

	Patients n/percent (%)	PSQI score P-value	ASES score P-value	CSS score P-value
Small (<1 cm)	25/36.2	0.0001	0.0001	0.0001
Medium (1–3 cm)	23/33.3	0.0001	0.0001	0.0001
Large (3–5 cm)	13/18.8	0.002	0.001	0.001
Massive (>5 cm)	8/11.6	0.011	0.012	0.012

PSQI, Pittsburg Sleep Quality Index; ASES, American Shoulder and Elbow Surgeons; CSS, Constant and Murley Shoulder Score. A P-value <0.05 was considered statistically significant

The coexistence of diabetes mellitus (DM) and hypertension (HT) (n=12) was an independent factor for sleep disturbance. The PSQI score was statistically low in this patients ($p=0.012$). There was no narcotic use in any patient. The other variables such as nicotine use, sex, BMI, job, asthma, coronary artery disease CAD, subacromial decompression, biceps intervention, and repair type did not independently affect sleep disturbance (statistically insignificant).

Postoperative hypotension was noted in 2 patients and treated with medication. There were no infection and neurovascular injury in the postoperative period. Concomitant carpal tunnel syndrome in the ipsilateral hand was observed in 3 patients. They were treated with splinting and physical therapy.

DISCUSSION

The first outcome of this study was the significant improvement in sleep disturbance in arthroscopy-treated patients with RCT. This development was lesser in massive tears compared to other tear types. The second outcome was the huge improvement in ASES score and CSS. The third outcome was the positive correlation between sleep quality and shoulder scores. The fourth outcome was that concomitant HT and DM with RCT negatively affected sleep disturbance.

The relationship of sleep disturbance and RCT was evaluated in a recent study (6,7). Although many studies on sleep disturbance with shoulder pathologies like subacromial impingement, glenohumeral arthrosis, and adhesive capsulitis have been reported, only a few studies have mentioned the effects of RCT on sleep disturbance studies (1,4,19). Cho et al. reported sleep disturbance with a mean of 8.1 PSQI score in patients with RCT, and chronic pain was the cause of sleep disturbance (19). Mulligan et al. demonstrated that nocturnal pain was the reason for sleep disturbance related to RCT (6). They reported nocturnal pain in 93% of patients and sleep disturbance by means of PSQI >5 in 71% of patients with RCT. Gumina et al. claimed that RCT was only one of the causes of sleep disturbance in middle-aged and elderly subjects (11). They also reported that nocturnal pain was the main cause of sleep disorders in patients with RCT. Khazzam et al. revealed that 94% of patients with RCT complained of nocturnal pain, with a mean PSQI score of 9.48 (20). However, they also found that 89% of patients with rotator cuff tendinitis (impingement) had nocturnal pain with a mean PSQI of 8.66. They claimed that symptoms of shoulder pain may not be clearly associated with rotator cuff disease severity (20). The mean PSQI of 10 for sleep disturbance in 92.5% of patients in our study was slightly higher than those in previous studies, which showed a correlation between sleep disturbance and RCT in this study.

Sleep disturbance improvement after arthroscopic RCT repair was first reported by Austin et al. in 2015 (7). Sleep disturbance with PSQI >5 was improved from 89% preoperatively to 38% 6 months postoperatively in that study. They claimed that sleep disturbance improvement continued to 6 months. Narcotic pain medication negatively affected sleep quality according to Austin et al. (7). Cho et al. reported sleep quality improvement in RCT repair after 12 months postoperative follow-up of 47 patients (14). However, 42% of patients still had PSQI >5, described as insomnia, according to that study. Serbest et al. determined an improvement in sleep disturbance from PSQI score of 15 preoperatively to 6 postoperatively after 6 months

follow-up of 31 patients treated for RCT (12). Although they found large improvement in sleep disturbance, 58% of patients still complained of sleep disturbance (PSQI >5) after 6 months postoperatively. Improvement of sleep disturbance from 89% of patients with RCT with a mean PSQI score of 11.7 preoperatively to 41% with PSQI score of 5.5 postoperatively was reported after a minimum of 24 months follow-up (13). In that recent study, improvement in sleep disturbance slightly increased after 6 months (13). They also claimed that narcotic analgesic use had a negative effect on sleep quality. In this study, sleep disturbance was decreased from 92.7% to 37.7%. The mean PSQI score was improved from 10 to 5.4. The mean follow-up period was 29.7 months, which was higher than those in previous studies. This indicated that, although there was a large improvement in sleep disturbance after arthroscopic RCT repair, sleep disturbance still continues in 37.7% patients after a minimum of 2 years follow-up. However, sleep disturbance in the general population was marked between 15%–35% (12,15,20). It can be noted that sleep disturbance decreased in the general population after arthroscopic RCT repair.

RCT size was not correlated with sleep disturbance according to Austin et al. (7). There were many studies in line with this study, which showed that tear size did not affect sleep disturbance (12,13,14,20). However, Gumina et al. reported that patients with small tears had poorer sleep quality than those with more severe tears (11). In contrast, in this study, massive tears caused poorer sleep quality compared to other tears. The difference of this outcome was explained by Gumina et al. who reported sleep disturbance only in the preoperative period but no sleep improvement in the postoperative period. Compared to that, improvement in sleep disturbance after 2 years of follow-up was evaluated in this study.

Clinical improvement in patients with RCT after repair was previously demonstrated (2,3,9,10). Shoulder scores were assessed as good for a long period (8,9,21). Shoulder scores and physical distress were improved after RCT repair in a 1-year follow-up study (17). Cho et al. reported improvement in psychological status and quality of life after 12 months of RCT repair (14). Austin et al. demonstrated correlation in simple shoulder test (SST), visual analog scale (VAS) for pain, and PSQI. Increase in SST correlates with decrease in VAS and PSQI (7). Horneff et al. reported that the correlation among SST, VAS, and PSQI continued to 24 months (13). Serbest et al. recorded a correlation between shoulder scales and sleep disturbance (12). In that study, a similar improvement was recorded for Western Ontario Rotator Cuff Scale, CSS, and PSQI after RCT repair in 6 months follow-up. Improvements in shoulder scales and sleep quality were correlated in the current study. Good outcomes in CSS and ASES score with better PSQI scores were demonstrated after 2 years follow-up.

Patients with concomitant DM and HT had poor

improvement in PSQI according to other subjects in this study. Many diseases were claimed to cause shoulder and elbow pain previously, in a wide range from tuberculosis to elbow stiffness (22,23). Khazzam et al. demonstrated that factors resulting in worse sleep quality in RCT were female sex, depression, low back pain, DM, cervical involvement, and elevated BMI (20). However, they did not study the factors that influenced RCT repair outcomes. Austin et al. recorded that the only independent demographic or surgical factor that affected postoperative sleep was narcotic pain medication use (7). Serbest et al. demonstrated no correlation between demographic variables and chronic disease and sleep disturbance in patient who underwent RCT repair (12). These studies analyzed variables independent from another. To the best of our knowledge, less improvement of sleep quality after RCT repair in patients with concomitant DM and HT was first mentioned in this study.

Pain management was showed to play a key role in sleep disturbance in previous studies (13,19). Pain control was usually correlated with increment in sleep quality. However this positive outcome was not enough for normal sleep quality. Specific rehabilitation programs for depression, anxiety and sleep disturbance also required (13). Although huge improvement in sleep disturbance in patients of this study, many patients also may need additional specific rehabilitation programs for normal sleep quality.

The strength of this study was that patients with psychiatric disorders and history of treatment for sleep disturbance were excluded. This criterion allowed a clearer investigation of RCT and repair effects on sleep disturbance. Exclusion of patients using narcotics also strengthened this effect. A minimum of 2 years follow-up was also another strength of this study. There were a few study limitations: lack of control group, retrospective nature, and no records for duration of symptoms. RCT repair effect on sleep disturbance with a control group was suggested for future studies.

CONCLUSION

Sleep disturbance in patients with RCT was improved after arthroscopic repair. This effect continued after 2 years follow-up. Sleep quality improvement was correlated with ASES score and CSS. Massive RCT and concomitant DM and HT negatively affect sleep improvement.

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

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Ethical approval: The study protocol was approved by the ethics committee of Sakarya University Faculty of Medicine (reference number 71522473/050.01.04/342).

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