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Does your sleeping position affect your shoulder pain?

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ABSTRACT

Aim: This study aimed to evaluate patients with shoulder pain according to their sleeping positions based on their clinical and magnetic resonance imaging (MRI) findings and to determine possible factors affecting shoulder pain.

Material and Method: A total of 115 patients were included in the study. The severity of shoulder pain was evaluated with the visual analog scale (VAS), shoulder function was evaluated with the simple shoulder test, and the ability to perform physical activities was evaluated with the QuickDASH questionnaire. The biceps tendon, rotator cuff (RC), subacromial-subdeltoid bursa, glenohumeral joint (GHJ), and acromioclavicular joint (ACJ) were evaluated using MRI.

Results: Of the patients with shoulder pain, 66.1% were female, 50.4% were primary school graduates, 53.9% were housewives, and 41.7% had a systemic disease. The mean age of the patients was 50.48±13.61 years while the median BMI and VAS values were 26.1 (18.2-41.4) and 8 (2-10), respectively. Considering the sleeping positions, it was found that 39.1% (most common) of the patients were sleeping in the fetus position, and considering the results of patients' MRI examinations, the most common problem was related to the pathologies of the supraspinatus tendon (42.6%). It was found that sleep quality, which was poor in all patients, was worse in females ($p=0.311$), in those over 50 years of age ($p=0.007$), and those with a systemic disease (0.325). It was discovered that Pittsburgh's sleep quality index score was generally worse in those who slept in the soldier position and in the log position ($p>0.05$). The rates of pathologies of the supraspinatus tendon were found to be the highest in those that slept in the fetus position ($p=0.931$). It was also found that the rates of impingement, bicipital tendinitis, combined problems, and adhesive capsulitis did not differ significantly according to sleeping positions. Although occupational variables for supraspinatus degeneration remained significant in the model, having a desk job statistically significantly increased the probability of supraspinatus degeneration by 3.38 times when compared to being a housewife (95% CI=1.143-9.996; $p=0.028$) and it was identified that the probability of acromioclavicular degeneration increased by 1.16 times for every 1-unit increase in BMI.

Conclusion: Different sleeping positions may predispose to different shoulder pathologies and shoulder pain, and shoulder pathologies may lead to deterioration of sleep quality, especially in older patients. For this reason, suggesting correct and appropriate sleeping positions may be a useful treatment method in reducing pain and disability and increasing sleep quality.

Keywords: Sleep position, shoulder pain, magnetic resonance

INTRODUCTION

The shoulder joint is the joint that anatomically connects the thorax and the upper extremity. The shoulder joint has a wide range of motion but little stability, and therefore, it is frequently exposed to traumas and injuries. Shoulder pathologies are very painful conditions due to the rich sensory innervation network (1). Prevalence studies indicate that the prevalence of shoulder pain affects 7-10% of the society (2). The most common causes of pain are rotator cuff (RC) pathologies originating from the tendon and bursa. Subacromial impingement syndrome (SIS) occurs as a result of the compression of the structures within the RC between the acromion, the coracoacromial ligament, the coracoid process, and the acromioclavicular joint (ACJ) through glenohumeral joint (GHJ) movements (especially during flexion and rotation) (3). SIS is the most common cause of shoulder pain with a prevalence of 44-65% (4). Vascular, degenerative, traumatic, mechanical, and anatomical causes are believed to lead to etiopathogenesis (5). Additionally, adhesive capsulitis, calcific tendinitis, ACJ degeneration, GHJ osteoarthritis, glenohumeral instability are among the causes of shoulder pain. Even though shoulder pain increases during the day due to activities of daily living

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and sports activities (swimming, volleyball, handball, etc.) that involve shoulder overhead mobility (6), night pain is one of the most common symptoms of shoulder pain. Some patients first complain of the pain that wakes them up in the middle of the night or that they feel when they wake up in the morning (7-9).

Considering that people spend most of their lives sleeping, sleeping positions can entail a risk for shoulder pain. In this study that was based on the view that some sleeping positions may trigger shoulder pain by increasing the subacromial pressure and disrupting the blood supply of anatomical structures, we aimed to evaluate patients with shoulder pain according to their sleeping positions using clinical and magnetic resonance imaging (MRI) findings and to determine possible factors affecting shoulder pain.

MATERIAL AND METHOD

The study protocol was approved by the Adana Çukurova University Balcalı Hospital Clinical Trials Ethics Committee (Date: 12.02.2021, Decision No: 55). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki. We retrospectively reviewed the medical records of this patients, who applied to the Physical Medicine and Rehabilitation Polyclinic of Adana City Training and Research Hospital with the complaint of shoulder pain from February to May 1, 2021, and who underwent MRI. Patients with a history of shoulder surgery and trauma, malignancy, and neurological, systemic, endocrine, metabolic, and rheumatic diseases were not included in the study. Demographic, clinical, and MRI findings of the patients were recorded. The patients were divided into 6 different groups according to their sleeping positions as fetus, log, yearner, soldier, prone, and starfish (Figure 1). The severity of shoulder pain (at motion/rest) was evaluated via the VAS. Shoulder function was evaluated with the SST, the ability to perform physical activities with the QuickDASH questionnaire, and the quantitative measurement of sleep quality was conducted with the Pittsburgh sleep quality index (PSQI).

QuickDASH allows evaluating a patient's ability to perform physical activities, taking their condition within the last week into account. This questionnaire consists of 11 questions scored between 1-5 according to the degree of difficulty. A special formulation is used in the calculation and the total QuickDASH score ranges from 0 to 100.

SST is a questionnaire consisting of 12 items concerning shoulder function. The total score that can be obtained from the questionnaire is between 0 and 12, and the items are scored using "Yes" or "No". The lower the score is, the greater the disability is.

PSQI provides an assessment of sleep quality, amount of sleep, presence, and severity of sleep disturbance in the previous month. This index consists of 7 subscales, namely subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime drowsiness. Total PSQI score is obtained by summing 7 subscales and can range from 0-21 points. A total PSQI score of ≤5 indicates good sleep quality, and that of >5 indicates poor sleep quality. The biceps tendon, RC, subacromial-subdeltoid (SA-SD) bursa, GHJ, and ACJ of the patients were evaluated in MRI examination.

Statistical Analysis

Continuous variables were expressed as mean±standard deviation and median (min-max) while categorical data were expressed in numbers and percentages. Normality analyzes of the continuous variables were performed with the Kolmogorov-Smirnov Goodness of Fit Test. When the data did not normally distribute, the Mann Whitney U Test was used for comparisons between two groups, and the Kruskal Wallis Test was employed for comparisons between three or more groups (the Mann Whitney U Test with Bonferroni correction was used for further analysis). The categorical data were analyzed through the Chi-Square Test. To predict the presence of findings evaluated by MRI, possible risk factors examined within the scope of the study and having a significance level of $p<0.25$ as a result of univariate analyzes were evaluated with the multivariate (Binary) Logistic Regression Model. The Hosmer Lemeshow Test was used for model fit. Analyzes were performed using the IBM SPSS version 22.0 (IBM Corporation, Armonk, NY, USA). The cases in which the type 1 error level was below 5% were considered significant.

RESULTS

The demographic and clinical characteristics of the 115 patients included in the study are shown in **Table 1**. When the sleeping positions were examined, it was observed that most of the patients (45%) were sleeping in the fetus position.

When the nominal demographic data were compared in terms of QuickDASH and PSQI scores, it was observed that the PSQI scores were significantly higher in the patients with shoulder pain aged 50 years and over compared to those aged 50 years and below in both genders [15 (3-21) vs. 9 (1-21)], and that the QuickDASH test scores were significantly higher in females than in males [61.3 (22.8-95.0) vs. 45.4 (13.6-90.9)] ($p=0.007$ and $p=0.003$, respectively) (**Table 2**).

The VAS, QuickDASH, and PSQI scores were found to be significantly higher in housewives (p=0.007) (**Table 2**).

The QuickDASH test scores [61.3 (22.8-95.0) vs. 45.4 (13.6-90.9)] were found to be significantly higher in females than in males (p=0.003) (**Table 2**).

The SST scores were found to be significantly higher in patients with supraspinatus degeneration (p<0.05) (**Table 2**).

The VAS scores were found to be significantly higher in patients that had combined problems (more than one disorder in the shoulder) (p<0.05) (**Table 2**).

The PSQI scores were found to be significantly higher in those with adhesive capsulitis (p<0.05) (**Table 2**).

It was observed that in those sleeping in the starfish position, the median values of the SST [7 (1-8)] were generally higher compared to those sleeping in the other positions, and the differences were statistically significant compared to those sleeping in the fetus position [2 (0-8)] and the soldier position [2 (0-4)] (p<0.05) (**Table 3**).

While those sleeping in the soldier position [18 (2-21)] and the log position [17 (2-21)] had the highest PSQI scores, those sleeping in the yearner position [10 (1-21)] and the fetus position [12 (2-19)] had the lowest PSQI scores. However, there was no statistically significant difference between the sleeping positions regarding the PSQI scores (p>0.05) (**Table 3**).

The rates of acromioclavicular degeneration were found to be the highest in those sleeping in the starfish position (16.7%) (p=0.618). The supraspinatus degeneration rates were found to be the highest in those sleeping in the fetus position (46.7%) (p=0.931). Similarly, the rates of impingement, bicipital tendinitis, combined problems, and adhesive capsulitis did not show a significant difference according to the sleeping positions (**Table 3**).

In order to predict the presence of findings evaluated by MRI, possible risk factors examined within the scope of the study and having a significance level of p<0.25 as a result of univariate analyzes were evaluated with multivariate logistic regression analysis. Although the variables of occupation and SST for supraspinatus degeneration remained significant in the model, when compared to being a housewife, having a desk job increased the probability of supraspinatus degeneration statistically significantly by 3.38 times (95% CI=1,143-9.996; p=0.028) (**Table 4**), and each 1-unit increase in BMI increased the probability of acromioclavicular degeneration by 1.16 times (**Table 5**).

Table 1. Demographic and clinical characteristics of the patient group experiencing shoulder pain

	Patient group (n=115)
Age (years) (Avg.±SD.)	50.48±13.61
BMI (kg/m²) [median (min-max)]	26.1 (18.2-41.4)
VAS [median (min-max)]	8 (2-10)
Gender (n, %)	
Female	76 (66.1)
Male	39 (33.9)
Educational background (n, %)	
Illiterate	13 (11.3)
Primary School graduate	58 (50.4)
Secondary-High School graduate	31 (27.0)
University graduate	13 (11.3)
Occupation (n, %)	
Housewife	62 (53.9)
Blue-collar	14 (12.2)
Desk job	20 (17.4)
Retired	19 (16.5)
Systemic disease (n, %)	
Yes	48 (41.7)
No	67 (58.3)
Shoulder pain (n, %)	
At motion	76 (66.1)
At rest	39 (33.9)
Sleeping positions (n, %)	
Fetus	45 (39.1)
Prone	25 (21.7)
Starfish	6 (5.2)
Soldier	7 (6.1)
Yearner	24 (20.9)
Log	8 (7.0)
Acromioclavicular degeneration (n, %)	
No	105 (91.3)
Yes	10 (8.7)
Supraspinatus degeneration (n, %)	
No	66 (57.4)
Yes	49 (42.6)
Impingement (n, %)	
No	104 (90.4)
Yes	11 (9.6)
Bicipital tendinitis (n, %)	
No	100 (87.0)
Yes	15 (13.0)
Combined problems (n, %)	
No	96 (83.5)
Yes	19 (16.5)
Adhesive capsulitis (n, %)	
No	111 (96.5)
Yes	4 (3.5)
Total	115 (100.0)

Table 2. Comparison of the VAS, SST, Quick dash test, and PSQI scores of the patient group with shoulder pain according to specific demographic and clinical characteristics

	VAS	P	SST	p	Quick dash test	p	PSQI	p
Age (year)		0.470*		0.086*		0.329*		0.007*
≤50 (n=57)	7 (3-10)		4 (0-8)		55.8 (20.4-95.0)		9 (1-21)	
>50 (n=58)	8 (2-10)		2 (0-10)		56.3 (13.6-90.9)		15 (3-21)	
BMI (kg/m²)		0.281*		0.685*		0.853*		0.251*
<30 (n=87)	8 (3-10)		3 (0-8)		55.8 (18.1-95.0)		10 (1-21)	
≥30 (n=28)	8 (2-10)		3 (0-10)		57.9 (13.6-90.9)		15 (2-21)	
Gender (n, %)		0.111*		0.310*		0.003*		0.311*
Female	8 (3-10)		2 (0-8)		61.3 (22.8-95.0)		14.5 (2-21)	
Male	7 (2-10)		4 (0-10)		45.4 (13.6-90.9)		10 (1-21)	
Educational attainment (n, %)		0.093**		0.059**		0.307**		0.335**
Illiterate	8 (7-10)		2 (0-8)		63.4 (18.8-90.9)		14 (3-21)	
Primary school	8 (3-10)		2 (0-8)		58.0 (18.1-95.0)		15 (1-21)	
Secondary-High school	7 (2-10)		4 (0-10)		47.7 (13.6-86.3)		10 (2-21)	
University	7 (3-10)		3 (0-7)		52.2 (25.0-72.7)		10 (3-17)	
Occupation (n, %)		0.004**		0.125**		0.001**		0.016**
Housewife	8 (5-10)a		2 (0-8)		63.4 (22.8-95.0)a		15 (2-21)a	
Blue-collar	7 (3-9)a		4 (0-8)		44.2 (20.4-75.0)a		6 (1-21)a	
Desk job	7 (3-10)a		4.5 (0-8)		52.2 (25.0-78.5)		8 (3-18)	
Retired	7 (2-10)		3 (0-10)		43.1 (13.6-90.9)a		12 (5-21)	
Systemic disease (n, %)		0.100*		0.561*		0.016*		0.325*
Yes	7 (2-10)		2.5 (0-10)		52.8 (13.6-86.3)		15 (2-21)	
No	8 (3-10)		3 (0-8)		59.0 (20.4-95.0)		12 (1-21)	
Shoulder pain (n, %)		0.686*		0.049*		0.125*		0.785*
At motion	8 (2-10)		2 (0-10)		60.9 (13.6-90.9)		14 (1-21)	
At rest	7 (5-10)		4 (0-8)		53.4 (18.1-95.0)		10 (2-21)	
Acromioclavicular degeneration (n, %)		0.023*		0.082*		0.113*		0.521*
No	8 (2-10)		2 (0-10)		56.8 (13.6-95.0)		14 (1-21)	
Yes	6.5 (4-8)		3 (2-8)		38.6 (25.0-68.1)		11 (2-21)	
Supraspinatus degeneration (n, %)		0.127*		0.028*		0.469*		0.095*
No	8 (3-10)		2 (0-8)		58.0 (18.1-95.0)		14 (2-21)	
Yes	7 (2-10)		4 (0-10)		55.4 (13.6-86.3)		10 (1-21)	
Impingement (n, %)		0.614*		0.943*		0.552*		0.360*
No	8 (3-10)		3 (0-10)		56.3 (13.6-90.9)		12 (1-21)	
Yes	7 (2-10)		4 (0-7)		47.7 (18.1-95.0)		15 (2-21)	
Bicipital tendinitis (n, %)		0.865*		0.775*		0.871*		0.505*
No	8 (2-10)		3 (0-10)		56.8 (13.6-95.0)		14 (1-21)	
Yes	8 (6-10)		2 (0-7)		47.7 (25.0-86.3)		8 (3-21)	
Combined disorders (n, %)		0.001*		0.004*		0.226*		0.623*
No	7 (2-10)		3 (0-10)		54.5 (13.6-95.0)		12 (1-21)	
Yes	9 (7-10)		1 (0-8)		61.3 (22.7-90.9)		14 (2-21)	
Adhesive capsulitis (n, %)		0.043*		0.829*		0.813*		0.016*
No	8 (2-10)		3 (0-10)		55.8 (13.6-95.0)		12 (1-21)	
Yes	6 (5-7)		2.5 (0-7)		54.5 (25.0-68.1)		19 (17-21)	

* Mann Whitney U Test, ** Kruskal Wallis Test (aMann Whitney U Test with Bonferroni correction; the difference between the two groups is statistically significant, p<0.01)

Table 3. Comparison of some clinical and MRI findings according to sleeping positions

	n	Fetus position	n	Prone Position	n	Starfish position	n	Soldier position	n	Yearner position	n	Log position	P
Pain at motion (VAS) [median (min-max)]	33	8 (5-9)	16	8 (4-10)	3	5 (3-7)	3	8 (7-10)	16	7 (2-10)	5	7 (7-8)	0.084*
Pain at rest (VAS) [median (min-max)]	12	7.5 (5-9)	9	7 (6-10)	3	5 (5-9)	4	7.5 (7-9)	8	7.5 (6-9)	3	9 (5-10)	0.798*
SST [median (min-max)]	45	2 (0-8)a	25	3 (0-8)	6	7 (1-8)a	7	2 (0-4)a	24	4 (0-10)	8	3 (0-5)	0.057*
Quick dash test [median (min-max)]	45	61.3 (22.8-86.3)	25	56.8 (18.1-90.9)	6	32.1 (27.2-95)	7	51.5 (43.1-77.2)	24	44.2 (13.6-86.3)	8	59.7 (25-75)	0.226*
PSQI [median (min-max)]	45	12 (2-19)	25	15 (4-21)	6	14 (2-21)	7	18 (2-21)	24	10 (1-21)	8	17 (2-21)	0.626*
Acromioclavicular degeneration (n, %)													0.618**
No	41	91.1	22	88.0	5	83.3	6	85.7	24	100.0	7	87.5	
Yes	4	8.9	3	12.0	1	16.7	1	14.3	0	0.0	1	12.5	
Supraspinatus degeneration (n, %)													0.931**
No	24	53.3	15	60.0	4	66.7	5	71.4	13	54.2	5	62.5	
Yes	21	46.7	10	40.0	2	33.3	2	28.6	11	45.8	3	37.5	
Impingement (n, %)													0.179**
No	42	93.3	23	92.0	4	66.7	6	85.7	23	95.8	6	75.0	
Yes	3	6.7	2	8.0	2	33.3	1	14.3	1	4.2	2	25.0	
Bicipital tendinitis (n, %)													0.135**
No	42	93.3	21	84.0	6	100.0	5	71.4	18	75.0	8	100.0	
Yes	3	6.7	4	16.0	0	0.0	2	28.6	6	25.0	0	0.0	
Combined problems (n, %)													0.707**
No	35	77.8	21	84.0	5	83.3	6	85.7	21	87.5	8	100.0	
Yes	10	22.2	4	16.0	1	16.7	1	14.3	3	12.5	0	0.0	
Adhesive capsulitis (n, %)													0.166**
No	44	97.8	25	100.0	6	100.0	7	100.0	23	95.8	6	75.0	
Yes	1	2.2	0	0.0	0	0.0	0	0.0	1	4.2	2	25.0	

* Kruskal Wallis Test (aMann Whitney U Test with Bonferroni correction; the difference between the two groups is statistically significant, p<0.008), ** Chi-square Test

Table 4. Logistic regression analysis for supraspinatus degeneration

	B	SE**	OR**	%95 CI**	p
Occupation (ref=housewife)					0.120*
Occupation (blue-collar)	0.912	0.615	2.488	0.745-8.314	0.139*
Occupation (white-collar)	1.218	0.553	3.380	1.143-9.996	0.028*
Occupation (retired)	0.368	0.544	1.445	0.497-4.200	0.499*
Simple shoulder test	0.119	0.082	1.127	0.960-1.322	0.144*
Constant	-1.068	0.358	0.344		0.003

* Multivariate (Binary) Logistic Regression Test (Backward: LR), (Omnibus Tests of Model Coefficients =0.037, Nagelkerke R Square=0.114, Hosmer and Lemeshow Test=0.627), ** SE=Standard error, OR=Odds Ratio, CI=Confidence interval, *** Age, gender, educational attainment, occupation, VAS, Simple shoulder test and Pittsburg sleep quality test were included in the model.

Table 5. Logistic regression analysis for acromioclavicular degeneration

	B	SE**	OR**	%95 CI**	p
VAS	-0.373	0.180	0.689	0.484-0.980	0.038*
BMI	0.156	0.076	1.169	1.007-1.356	0.040*
Constant	-4.168	2.417	0.015		0.085

* Multivariate (Binary) Logistic Regression Test (Backward: LR), (Omnibus Tests of Model Coefficients =0.016, Nagelkerke R Square=0.155, Hosmer and Lemeshow Test=0.177), ** SE=Standard error, OR=Odds Ratio, CI=Confidence interval, *** Age, gender, BMI, VAS, Simple shoulder test, Quick dash test were included in the model

DISCUSSION

When the shoulder pathologies were examined according to the sleeping positions of patients with shoulder pain, it was found that the rates of acromioclavicular degeneration were higher in those sleeping in the starfish position, and the rates of supraspinatus lesions were higher in those sleeping in the fetus position. Moreover, it was determined that age was predictive in all shoulder pathologies, pain scale scores were higher in patients with combined shoulder disorders, and sleep quality was worse in patients diagnosed with adhesive capsulitis.

Pathologies of the supraspinatus tendon are the most common causes of shoulder pain and dysfunction. The incidence of shoulder pain is increased in activities in which the arms are held above the head. Therefore, different sleeping positions may affect shoulder pain and pathologies in different ways. Holdaway et al. (10) believe that prone and starfish sleeping positions are the most risky because keeping the arms above the head leads to the narrowing of the subacromial space and increases intra-articular pressure, and the RC mechanism is compressed between the acromion, coracoacromial ligament, coracoid process, and ACJ. Zenian reported that the risk of pain in the shoulder on which one lies increases in the lateral recumbent position (11). In their study, Werner et al. (12) defined 4 different sleep positions and measured the subacromial pressure with the catheter inserted in the SA-SD bursa, and observed the lowest pressure in the supine sleeping position (soldier position) and the highest pressure in the supine position with the arms next to the head, prone (prone-starfish) and lateral recumbent positions. Karabay et al. (13) found that the risk of pain caused by shoulder movement, SIS, and partial supraspinatus tendon rupture increased in the most preferred "fetus" position, which is a lateral recumbent position. In our study, in compliance with the literature, supraspinatus degeneration rates were found to be highest in those sleeping in the fetus position. There is a smaller contact area between the body and the bed in the lateral recumbent position than in the supine or prone positions, so more pressure is placed on the shoulders. Measuring skin pressure, Seiler et al. (14) showed that body weight creates more pressure on the shoulder contact area in the lateral recumbent position than in the supine position.

It was observed in our study that adhesive capsulitis did not develop in any of the participants sleeping in the "soldier" position, which did not increase the subacromial pressure, and of those sleeping in the prone and starfish positions. In addition, it was found that biceps tenosynovitis did not develop at all in those sleeping in the starfish and log positions. Holdaway et al. (10) reported that sleep positions that do not increase subacromial pressure are preferred in patients with shoulder pain. These results suggest that shoulder pathologies may occur due to the sleeping position and that patients may choose a sleeping position in which they will feel less pain. Therefore, it is possible to say that there is an inevitable relationship between sleeping positions and shoulder pain: sleeping position may be the cause of pain or it may be used as a measure to protect/recover from pain, or the sleeping position may be a result of shoulder pain.

According to Neer, osteophytes that develop due to degenerative changes that occur with age in ACJ cause impingement syndrome by extending into the subacromial space (15-16). In line with the literature, our study shows that the incidence of shoulder pathologies increases with age.

At the beginning of the twentieth century, Ernest Amory Codman reported in his studies that pain and movement limitations in shoulder abduction without trauma were caused by complete and partial RC muscle tears, as well as SA bursitis (17-20). Similarly, in our study, impingement and supraspinatus pathologies were observed at a higher rate in those sleeping in the starfish position in which the arms were slightly abducted.

The most well-known and widely accepted association between sleep and shoulder pain is that shoulder pain reduces sleep quality (21-22). Patients with shoulder pain experience sleep problems in a spectrum between feeling tired when they wake up in the morning, and waking up in the middle of the night and taking painkillers to relieve the pain (23). Our study found that most of the patients had poor sleep quality and this rate was higher in those over 50 years of age. Apart from sleep quality, another possible relationship between shoulder pain and sleep is due to sleep posture. In the study published by Werner et al. in 2010 on the subject, a pressure-measuring catheter was inserted into the SA bursa in 20 healthy volunteers, and the amount of SA pressure and pressure changes were recorded during four different arm positions and body posture combinations. The results revealed that SA pressure was higher on the shoulder on which the participant was lying and on the shoulder with the arm being abducted (24). It can be thought that having pain in the shoulder will prevent the person from lying on that shoulder, and they should turn to the side of the shoulder that does not hurt in order to protect themselves. However, the pain in question here is not a rapidly transmitted one that is observed in acute situations such as fractures, which undergo rapid changes when moving. The pain occurring with SIS is blunt and is slowly transmitted. Since the pain does not occur suddenly or increase with pressure, it does not prevent the person from lying on the aching shoulder (25). Our study revealed that most of the patients with poor sleep quality have increased pain at night. These findings suggested that sleep disorder could effect daily life of patients negatively and the patients with shoulder pain need to be further researched in terms of night pain.

The limitations of our study are as follows: the sleeping positions of the patients were recorded based on their own statements, and more objective and indicative data such as polysomnography were not obtained, the distribution within the groups was heterogeneous and there was no control group. On the other hand, among the strengths of the study are the patients were evaluated based on their MRI findings and tests assessing shoulder pain and function in detail.

In conclusion, it should be taken into consideration that evaluating sleep positions can be guiding in providing treatment for shoulder pain, which is one of the problems that can significantly affect daily life activities and the labor force and recommending correct and appropriate sleeping positions can be a useful treatment method in reducing pain and increasing sleep quality.

ETHICAL DECLARATIONS

Ethics Committee Approval: Approval for the study was granted by the Adana Çukurova University Balcalı Hospital Clinical Trials Ethics Committee (Date: 12.02.2021, Decision No: 55).

Informed Consent: Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process: Externally peer-reviewed. Conflict of Interest Statement: The authors have no conflicts of interest to declare.

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