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The relationship between shoulder impingement syndrome and sleep quality

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Abstract. – BACKGROUND AND OBJECTIVES: The aim of this study was to examine potential relationship between subjective sleep quality and degree of pain in patients with shoulder impingement syndrome (SIS).

MATERIALS AND METHODS: Fourty patients with shoulder impingement syndrome were evaluated using the Pittsburgh Sleep Quality Index (PSQI) and the Shoulder Disability Questionnaire (SDQ). Forty three of age and sex matched healthy subjects were included in the control group.

RESULTS: There was a significant difference between the patient and control groups in terms of all PSQI global scores and subdivisions ($p < 0.01$). The pain scores assessed by SDQ were positively correlated with the scores for subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, and sleep disturbance ($r = 0.49/p < 0.01$, $r = 0.44/p < 0.01$, $r = 0.36/p < 0.05$, $r = 0.40/p < 0.05$, and $r = 0.37/p < 0.05$ respectively). The comparison of total SDQ pain and global PSQI scores also revealed a significant correlation ($r = 0.54/p < 0.01$).

CONCLUSIONS: Subjective sleep disturbance connected to shoulder pain was found obviously in patients with SIS. For this reason, patients with shoulder pain due to SIS may benefit from the pain killers and cognitive-behavioral interventions that specifically target sleep disturbances. Further studies which contain polysomnographic assessments, as well as determine psychologic status are still needed to put forth sleep quality in patients with SIS.

Key Words:
Shoulder pain, Shoulder impingement syndrome, Sleep quality.

Introduction

Sleep disturbances and pain due to chronic rheumatic diseases are quite often encountered complaints in clinical practice. Individuals with arthritis and muscle pain experience sleep disturbances frequently. Indeed, difficulties in initiating and maintaining of sleep are one of the major consequences of rheumatic pain syndromes[1].

Shoulder pain is a very common condition that often has a multifactor underlying pathology and is associated with high social cost and patient burden. The prevalence of shoulder pain accompanied by disability is approximately 20% in the general population. Persistent shoulder pain is related with various degenerative and traumatic lesions such as bursitis, tendonitis, rotator cuff tear, adhesive capsulitis, impingement syndrome, avascular necrosis, glenohumeral osteoarthritis either in combination or as a separate entity[2]. While the prevalence of shoulder pain reported by the practitioners was 12% of the total weekly patients, with the major cause (32%) of symptoms related to overuse[3]. It was the second commonly reported symptom (49%) following the neck pain (69%) in computer students of fourth year course[4]. Subacromial impingement syndrome (SIS) of the shoulder occurs due to a mechanical disturbance and impingement of rotator cuff tendons, especially supraspinatus muscle tendon within the subacromial space and is characterized by pain and functional restrictions mostly during at night and over head activities[5]. SIS is the most frequently recorded disorder (44%) between various diagnoses of shoulder problems in general practice[6]. The correct diagnosis is made through the patient history, physical examination and with appropriate diagnostic imaging.

Pain and sleep disturbance are two important complaints interacting in complex ways that ultimately impact the biological and behavioral well being of the individual. Painful conditions often disturb sleep and may affect negatively daytime activities. On the other hand, there is evidence that appropriate recognition and management of the sleep complaint may alleviate pain symptoms related to the associated condition and help interrupt this vicious cycle[7].

Recently, a strong relationship between subjective experiences of pain and impaired sleep quality has been described among chronic pain patients, including those with back pain[8], rheumatoid arthritis[9], and severe burns[10].More specifically, patients with severe

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pain report poor sleep, delayed sleep onset, increased number of awakenings due to pain, and fewer hours of sleep per night[8,10-14]. Despite a strong association between sleep and pain, surprisingly, few attempts have been undertaken to investigate the relationship between chronic pains and sleep disturbance using measures with established psychometric properties[1]. The majority of the studies show a significant, but relatively moderate positive relationship between pain severity and sleep complaints[15-17]. In a recent study, we evaluated the association between the subjective sleep quality and pain threshold in fibromyalgia and found a negative correlation between pain and sleep disturbance: increased pain sensitivity was associated with greater sleep disturbance[11].

In this study, our purpose were twofold: the first, examining subjective sleep quality in patients with SIS; and the second, investigation of potential correlation between severity of symptoms and sleep quality in these patients.

Materials and Methods

A total of 76 subjects with a diagnosis of SIS by shoulder magnetic resonance imaging (MRI) investigation between 18-65 years old were selected among outpatients, consecutively admitted to the Physical Medicine and Rehabilitation Department, in the University Hospital. The study was performed in accordance with the principles of the Declaration of Helsinki, and the protocols were approved by the University Ethics Committee.

These patients had shoulder pain for the first time and were within the acute phase of the disease (symptoms lasted for less than three weeks). To be classified as having SIS, patients had to demonstrate at least three of the following criteria: (1) a positive Hawkin's test, (2) a positive Neer test, (3) pain with active shoulder elevation[18]. The diagnosis of SIS was confirmed by the referring physician according to these criteria and shoulder MRI result. We required all subjects to meet same common standart that included the followings: (1) presence of SIS, (2) age between 18 and 65 years, (3) no history of psychotic or mood disorders or current substance abuse according to DSM-IV (Diagnostic and Statistical Manual of Mental Disorders) criteria, (4) abstinence from psychotropic drug use for at least 2 weeks, and (5) provision of informed consent for participation in the study. Patients excluded from the study if they have following exclusion criteria: (1) patients with rotator cuff tears, frozen shoulder or, acromioclavicular arthritis, (2) history of direct trauma to the shoulder, (3) history of sleep disorder, (4) patients with secondary shoulder pain, resulting from referred pain from cardiac and pulmonary disorders, malignancies, infections, primary fibromyalgia, restless legs syndrome and any other systemic diseases[4] presence of underlying neurologic, inflammatory or rheumatic diseases or extrinsic diseases such as cervical spondylosis with referring pain to the shoulder[5], patients who had received intra-articular or subacromial steroids within the last 3 months.

The study was explained to all subjects who met the criteria, and they were asked to read and sign the informed consent agreement approved by the University Ethical Board. Thirty-six patients excluded from the study according to the exclusion criteria (14 patients due to rotator cuff tears, frozen shoulder or acromioclavicular arthritis, 12 patients due to history of direct trauma to the shoulder, 9 patients due to intra-articular or subacromial steroid injections within the last 3 months, 1 patient history of sleep disorder). Remained forty patients with SIS (twenty-seven females and 13 males with the mean age of 46.4±13.4 yr [mean ± SD] were included in the study.

A control group was formed with age and sex matched healthy voluntary subjects who had not experienced shoulder pain previously (17 males and 26 females, with the mean age of 44.6±12.2 yr) who signed their informed consent for participation in the study. In addition, while selecting the control group, the other exclusion criteria which were applied to the patient group were used.

Sleep Quality Assessment

The Pittsburgh Sleep Quality Index (PSQI)[19], an instrument with previously established reliability and validity, was applied to the subjects to assess their sleep qualities during one month prior to study. The PSQI consists of 19 self-rating questions each having a grading from 0 to 3 which are are grouped into seven subcategories. The subcategories are subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbance, use of sleeping medications, and daytime dysfunction. The seven subcategories are then summed to yield a global PSQI score, which has a range from 0 to 21; higher scores are indicative poorer sleep quality. The reliability and validity study of the Turkish version of the PSQI was evaluated by Agargun et al[20], who demonstrated a high level of internal consistency of Turkish ver-

sion of the index (Cronbach α = 0.804 for all items) namely, The Cronbach α coefficients for individual subcategories were found 0.88, 0.87, 0.92, 0.91, 0.84, 0.67, and 0.35.

Shoulder Disability Questionnaire (SDQ)

The Shoulder Disability Questionnaire (SDQ) developed by Windt et al[21] to assess the shoulder pain has recently been translated to Turkish and validated by Ozsahin et al[22]. The subjects were able to fill in the test within a few minutes. The Turkish version of SDQ was found to have a moderate relation with pain during rest and sleep and week relation with pain during motion.

Both the patient group and healthy voluntary control group filled out Pittsburgh Sleep Quality Index. As well as Shoulder Disability Questionnaire was filled out by the patient group.

Statistical Analysis

Analyses were performed using SPSS for Windows Version 10 (SPSS Inc, Chicago, IL, USA). Data represented as mean±SD. Associations between the Shoulder Disability Questionnaire pain (SDQ) scores and PSQI global and subcategories scores were explored with Pearson correlation co-efficient test. Student's *t* test was used to compare PSQI scores of the patient with those of control group. $p < 0.05$ was considered statistically significant.

Results

There were no statistically significant differences between patient and healthy control groups in terms of age, sex, educational status and body mass index (BMI) ($p > 0.05$) (Table I).

The mean total shoulder disability questionnaire (SDQ) pain score of the patients was 75.4±19.01. The mean PSQI global scores of the patient and healthy control groups were 11.57±4.34 and 4.82±2.66, respectively (Table III).

The mean PSQI subcategories and global scores of two groups are listed in Table II. The difference between the patient and control groups in terms of all PSQI subcategories and global scores were statistically significant ($p < 0.01$). The patients had higher PSQI scores that mean lower sleep quality compared to controls. The correlations of PSQI and total SDQ pain scores in the patient group presented in Table III. The SDQ pain scores were positively correlated with poorer quality in most of the subgroups of PSQI (subjective sleep quality, sleep latency, sleep duration, sleep efficiency, and sleep disturbance ($r = 0.49/p < 0.01$, $r = 0.44/p < 0.01$, $r = 0.36/p < 0.05$, $r = 0.40/p < 0.05$, and $r = 0.37/ p < 0.05$ respectively). Scores for sleep medication and daytime dysfunction were not significantly correlated with SDQ pain scores ($r = 0.16/p > 0.05$, $r = 0.26/p > 0.05$, respectively). The comparison of total SDQ pain and global PSQI scores also revealed a significant correlation ($r = 0.54/p < 0.01$).

Discussion

Sleep quality in some of the musculoskeletal disorders was investigated in previous studies[8-10,23-28]. In this study, for the first time in the literature available online, using a subjective sleep quality index, we examined the association between sleep quality and pain severity in patients with SIS. We found that patients with SIS had higher scores in terms of both all PSQI subcategories and PSQI global score than the healthy controls (Table I). That implies patients with SIS had lower sleep quality than the healthy subjects. The current study has also showed significant correlations between the SDQ pain severity and most measures of PSQI (Table II).

The present findings suggest a strong correlation between poor sleep quality and pain severity in accordance with the previous studies that focused on other localizations of pain other than shoulder. What are the underlying mechanisms

Table I. Demographic properties of the groups.

Demographic properties	Patient group n = 40	Healthy group n = 43	*p* value
Gender (female/male)	27/13	26/17	0.79
Age (year) (mean ± SD)	46.4 ± 13.4	44.6 ± 12.2	0.86
Body mass index (mean ± SD)	26.1 ± 3.8	25.8 ± 4.1	0.63
Education (yr) (mean ± SD)	8.7 ± 5.3	8.9 ± 5.5	0.71

SD: standart deviation.

Table II. The mean Pittsburgh Sleep Quality Index component and global scores of the patients and healthy controls.

	SIS patients (mean ± SD)	Healthy controls (mean ± SD)	*t*	*p*
Subjective sleep quality	1.91 ± 0.92	1.17 ± 0.61	4.50	< 0.001
Sleep latency	1.71 ± 0.93	0.51 ± 0.71	6.29	< 0.001
Sleep duration	1.91 ± 1.22	0.65 ± 0.62	6.04	< 0.001
Habitual sleep efficiency	1.92 ± 1.26	0.45 ± 0.95	5.86	< 0.001
Sleep disturbance	1.70 ± 0.60	1.10 ± 0.54	4.64	< 0.001
Use of sleeping medications	0.27 ± 0.67	0.02 ± 0.65	2.26	< 0.05
Daytime dysfunction	2.07 ± 0.79	0.97 ± 0.76	6.28	< 0.001
PSQI global	11.57 ± 4.34	4.82 ± 2.66	8.38	< 0.001

PSQI: Pittsburgh Sleep Quality Index; SD: Standard deviation.

of the relationship of sleep disturbances or poor sleep quality with pain? The data obtained in the current study do not help to explain this mechanism; nevertheless, one may speculate that it might be related with biochemical changes in the brain. However, there are some possible explanations in the literature.

There are complex interactions among pain perception, sleep disturbances, and neurotransmitters in pain conditions such as fibromyalgia[11]. For example, Smith et al[15] suggested that this relationship appears to be straightforward: pain causes arousal and arousal interferes with the ability to initiate and/or maintain sleep. Other data also suggested that poor sleep may aggravate pain perception and reduce one's ability to cope with pain by creating a vicious cycle[29]. It is well-known that sleep disturbances may be directly related to the pathogenesis of some pain conditions. For instance, poor sleep quality due to non-REM sleep abnormalities may be directly related to the deep muscle pain in fibromyalgia patients[30]. Poor sleep quality means poor sleep efficiency due to non-REM sleep abnormalities.

Table III. The Pearson Correlations of Pittsburgh Sleep Quality Index scores with total Shoulder Disability Questionnaire Pain scores in patients with SIS.

PSQI components	r	*p*
Sleep quality	(+) 0.49	0.001
Sleep latency	(+) 0.44	0.004
Sleep duration	(+) 0.36	0.022
Habitual sleep efficiency	(+) 0.40	0.011
Sleep disturbance	(+) 0.37	0.016
Use of sleeping medication	(+) 0.16	0.30
Daytime dysfunction	(+) 0.26	0.09
Global severity	(+) 0.54	0.001

PSQI: Pittsburgh Sleep Quality Index.

Eventhough, we selected the patients among those without history of psychiatric disease, SIS may affect psycologic status of patients due to shoulder pain, restriction of shoulder joint range of motion or deterioration in daily living activities. Recent studies have examined how mood and positive or negative emotional events impact upon sleep-related and pain-related behavioral symptoms[23,24]. Hamilton et al[23] showed that sleep duration and sleep quality in 89 women with FMS are prospectively related to psychological distress and fatigue. In another work[9], the sleep problems of patients with FMS are perceived to be more troublesome than in those with rheumatoid arthritis (RA) even when pain and depression are adjusted[24]. Therefore, patients with SIS may benefit from the cognitive-behavioral interventions that specifically target sleep disturbances accompanied by pre-sleep cognitive arousal[15]. Thus in addition to pain medications, cognitive-behavioral interventions should be considered in those patients and poor sleep quality in terms of pain perception and patients' ability to cope with chronic pain.

Limitations of the current report were that objective assessment of sleep disturbance was not made since we used PSQI which is a subjective tool for evaluating sleep quality and the effect of SIS on psychologic status was not determined. However, this is the first investigation which evaluates sleep quality in patients with shoulder pain compared with the healthy control group, and by exclusion of other shoulder pathologies, we aimed to show how a specific shoulder pathology affects the status of sleep quality. We also aimed to eliminate psychosomatic effects of chronic pain syndrome on the patients by including in the study only patients within the acute phase of the disorder.

In conclusion, we have determined the sleep quality in patients with SIS subjectively by using

PSQI and SDQ. According to the results of the current study, SIS disrupts the sleep quality significantly. Deterioration of the sleep quality in these patients is correlated with pain scores assessing by SDQ. Alongside the pain killers, patients with shoulder pain due to SIS may benefit from the cognitive-behavioral interventions that specifically target sleep disturbances.

Further reports which contain polysomnographic assessments, as well as determine psychologic status are still needed to put forth sleep quality in patients with SIS. Thus, the physical and physiological processes during sleep may be exhibited more clearly in patients with SIS. Also, further multicenter studies are needed to put forward how the quality of sleep is affected in the other shoulder pathologies by providing sufficient number of patients in the investigations.

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