Association of rotator cuff injuries with night pain and sleep quality. A systematic review

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Systematic Review

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Background

Introduction: Growing evidence suggests that shoulder injuries involving the rotator cuff structures cause severe pain and impaired quality of life and sleep, with no systematic reviews to date.

Objective: To present the results of a systematic review on the association of rotator cuff injuries with night pain and sleep quality before and after treatment.

Methodology: A search was carried out in PubMed limited to humans, without limits on language, age and time period with the following terms: [rotator cuff tear and (nocturnal pain OR sleep)]. PRISMA criteria for systematic reviews were used. Information was extracted on the frequency of night pain and sleep quality in patients with rotator cuff injuries.

Results: Of 123 records found, 10 studies were included because they met criteria, which included 1516 patients. Night pain affected 91-93% of patients; Its average intensity was 5.5 VAS points. 100% of the studies reported alterations in sleep quality in patients with rotator cuff injury. After surgical repair, all studies reported a decrease in pain to scores within 2 points and an improvement in sleep quality. Alterations in sleep quality were not only associated with pain but also with abnormalities in shoulder functionality.

Conclusions : Rotator cuff injuries cause night pain and alterations in sleep quality that improve with treatment. Alterations in sleep quality are due not only to pain but also to alterations in shoulder functionality.

Keywords. Injuries, rotator cuff, night pain, sleep quality.

Rotator cuff injuries are a serious health problem that affects up to 20% of the general population, whose incidence increases with age and affects women slightly more than men (1) . Various risk factors have been identified for its development including hand dominance, age >60 years, and trauma (2) .

Substantial full-thickness rotator cuff tears generally progress and increase in size over time (3) . Pain, or worsening pain, usually indicates tear progression in both asymptomatic and symptomatic tears and should justify additional measures if the tear was initially treated conservatively (4,5) .

Recently, reports have appeared about the negative impact of rotator cuff injury on the quality of life of patients (6,7) , although little attention has been given to the presence of night pain in patients with this injury and to the alterations of sleep quality in these patients (8) .

Given the generation of an important accumulation of information in recent years and the need to have synthesized and updated information on this topic, in this systematic review, we present the evidence that exists on the association of rotator cuff injury with night pain and alterations in sleep quality, as well as the change in these symptoms induced by the treatment.

Methods

Article inclusion criteria

We searched for original articles on night pain or sleep quality in patients with rotator cuff injury. Those studies that were clinical trials, quasi-experimental, observational or case series were selected in which the presence of nocturnal pain and the quality of sleep evaluated with any scale, including the Pittsburgh Sleep Quality Index, were evaluated before or after treatment (PSQI) or the Epworth Sleepiness Scale; that measured the frequency and/or intensity of pain with any scale including the VAS; and shoulder scale scores including Constant-Murley or Oxford.

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Year, Country	Design
Austin, 2015	Prospective cohort
USA	n=56
	Age= 59.8 (45-78)
	Sex M:F %= 48.2:51.8
	Tx= yes, RMR
	S= 2, 6, 12, 18, and 24 weeks
	ED=EVE
	ECS= PSQI
Cho, 2015	Prospective cohort
Korea	n= 47
	Age= 57 ± 8 (43–75)
	Sex M:F %= 43:57
	Tx= yes, RMR
	S= 3, 6 and 12 months
	ED= EVE, ASES
	ECS= PSQI
Gumina, 2016	Cross-sectional-analytic
Italy	n= 508 (case group= 324, control =184)
	Age= 64.94 ± 6.97; 63.34 ± 6.26
	Sex M:F= 48.1: 51.9; 43.5:56.5
	Tx= yes, RMR
	S= does not apply.
	ED= not measured
	ECS= ESS, PSQI
Serbest, 2016	Prospective cohort
Turkey	n= 31
	Age= 61 (26-75)
	Sex M:F%= 29: 71
	Tx= yes, RMR
	S= 6 months
	ED= not reported
	ECS= PSQI, PCM
Horneff, 2017	Prospective cohort
USES	n= 56
	Age = not reported
	Sex M:F= not reported
	Tx= yes, RMR and narcotics
	S = > 24 months
	ED= EVA
	ECS = PSQI
Kings, 2017	Transversal-analytical
USES	n= 209
	Age= 64.1 ± 9.9 (38-91)
	Sex M:F= 46/54
	Tx= no
	S= 24 months
	ED=EVA, ASES
	ECS= PSQI
Khazzam, 2018	D: Prospective cohort
USES	n= 391
	Age= 56.8 (18-91)
	Sex M:F= 46.5:53.5
	Tx= no
	S= not reported
	ED= ASES
	ECS= PSQI
Bingol, 2021	Retrospective cohort
Turkey	n= 76
	Age= 60.39 ± 9.04
	Sex M:F= 36.8:63.2
	Tx= yes , RMR
	S= 12 months
	ED= OSS
	ECS= PSQI
Longo, 2021	Prospective cohort
Italy	n= 58
	Age= 63.4 ± 13 (18-87)
	Sex M:F= 50:50
	Tx= yes, RMR
	S= 1,3 and 6 months
	ED= OSS, ASES, PCM
	ECS= PSQI

Table 1. Characteristics of included studies. *D: design, M, masculine. F, feminine. Tx, Treatment. CSS, Comprehensive and Comparable Assessment of Shoulder Function. ED, Pain Measurement Scales. ECS, Sleep Quality Measurement Scales. EF, Functionality Measurement Scale. PSQI, Pittsburgh Sleep Quality Index. SST, Simple Shoulder Test. VAS, Visual Analog Scale for Pain. SANE, single evaluation numerical evaluation ASES, Elbow Surgeons Scale. OSS, Oxford Shoulder Score. ESS, Epworth Sleepiness Scale. RMR, Rotator Cuff Repair. SST, Simple Shoulder Test. BMI, Body Mass Index. PCM, Constant-Murley Score.*

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Author, year/Country	Results
Mulligan, 2015 USES	• Nocturnal pain was found in 93% of patients. • The mean pain intensity was 5.2±2.5 at baseline. No postoperative scores were reported. • Alterations in sleep quality occurred in patients with rotator cuff injury. • No association was found between pain and sleep quality
Austin, 2015 USES	• Nocturnal pain was specifically reported. • Non-nocturnal pain was on average 3 points at 6 months and 2 VAS points at 24 months. • After surgery, improvement in the PSQI was achieved at 3 months (p = 0.0012; 91% follow-up) and continued for 6 months (p = 0.0179; 93% follow-up). • Six months after surgery, only 38% of patients continued to have sleep disturbances.
Cho, 2015 Korea	• Nocturnal pain was specifically reported. • Non-nocturnal pain was on average 4.3 points at 6 months and 1.3 VAS points at 12 months. • The PSQI score decreased from 6.6 ± 3.6 before surgery to 4.2 ± 3.3 at 12 months post-surgery (p<0.001). • The PSQI score was not correlated with the VAS or ASES score.
Gumina, 2016 Italy	• Nocturnal pain was specifically reported. Nor does non-nocturnal evolution. • Patients with small tears had higher mean PSQI and ESS than patients with large, massive tears (p < 0.005). • Tear severity was negatively correlated with sleep latency (r2 = -0.35, b = 0.069, p < 0.005) and sleep disturbances (r2 = -0.65, b = 0.053, p < 0.005).
Serbest, 2016 Turkey	• Nocturnal pain was specifically reported. • No pain scores were reported. • There was a significant difference preoperatively and postoperatively on the PSQI (p < 0.001). • Significant improvements were achieved in the Constant-Murley Score (p 0<001).
Horneff, 2017 USES	• Nocturnal pain was specifically reported. • A significant improvement of the PSQI score was reported (5.5, 37 patients). Of these, 41% still had a score of >5, indicative of sleep disturbance. • Both SST and VAS scores showed continued improvement. Pain went from 5.5 preoperatively to 2 points at 6 months and 1.5 at 24 months. • Both scores showed a moderate strength correlation with the PSQI score (VAS: Spearman = 0.479, p < 0.001; SST: Spearman = 20.505, p < 0.001). • Patients who used narcotics had a higher PSQI score than non-narcotic users (p=0<00017).
Kings, 2017 USES	• Nocturnal pain was specifically reported. • The mean PSQI score was 9.8 and the mean VAS score was 5.0. • No significant correlations were found between any of the rotator cuff tear characteristics and sleep quality. • No correlation was found between sleep disturbances and pain.

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Khazzam, 2018 USES	• Night pain was reported by 91% of the 391 participants (274 with tendonitis and 117 with rotator cuff tears). • The average pain level was 5.0 VAS points. • Poor sleep quality in tendonitis and rotator cuff tear was associated with higher VAS scores (0.27 and 0.31; p = 0.004 and p < 0.0001, respectively).
Bingol, 2021 Turkey	• Nocturnal pain was specifically reported. Neither does non-nocturnal pain. • The preoperative values of PSQI, CSS and OSS of the patients were calculated as a mean of 10.79 ± 3.58, 35.61 ± 8.88 and 17.61 ± 4.20 and the mean postoperative values as 5.45 ± 1.68, 81.55 ± 5.27 and 38.05 ± 3.06, respectively. • The postoperative PSQI value was significantly lower in patients with tears <1 cm (4.29 ± 0.73) than in those with 1-3 cm (5.50 ± 2.17) and 3-5 cm (5.88 ± 1.25) (p < 0.001). • Mean CSS and OSS values were significantly higher in postoperative measurements for all tear types.
Longo, 2021 Italy	• Nocturnal pain was specifically reported. Neither does non-nocturnal pain. • A global improvement was found in all the scores analyzed (p <0.001). • Preoperative and postoperative PSQI scores were correlated with SST, ASES, and PCM scores at each follow-up. • Preoperative and one-month postoperative OSS were correlated with the PSQI score.

Table 2. Main results of the studies on the frequency of night pain, pain intensity, sleep quality, functional scales and the association between these parameters in patients with rotator cuff injury.

Search strategy and information sources

A search was carried out in PubMed, Scopus and *Web of Science* with the following MESH terms , no time limit neither language : *rotator cuff tear and (nocturnal pain OR sleep);* that is , with the following criteria expanded : ("rotator cuff injuries"[MeSH Terms] OR ("rotator"[All Fields] AND "cuff"[All Fields] AND "injuries"[All Fields]) OR "rotator cuff injuries"[All Fields] OR ("rotator"[All Fields] AND "cuff"[All Fields] AND "tear"[All Fields]) OR "rotator cuff tear"[All Fields]) AND ((("nocturnal"[All Fields] OR "nocturnality" [All Fields] OR "nocturnally"[All Fields]) AND ("pain"[MeSH Terms] OR "pain"[All Fields])) OR ("sleep"[MeSH Terms] OR "sleep"[All Fields] OR "sleeping"[All Fields] OR "sleeps"[All Fields] OR "sleep s"[All Fields])) . Relevant publications were manually searched for additional potentially relevant studies.

Study selection and data extraction

To carry out the study, the PRISMA criteria for systematic reviews were used (9) . All abstracts found on the topic of interest were evaluated by two independent evaluators and in case of discrepancy in the selection, a third researcher independently and blindly resolved the disagreement. Those studies that met the inclusion criteria were reviewed in full text to identify studies that did report results of interest on pain and sleep quality alterations in patients with rotator cuff injury before or after treatment.

The following information was extracted from the publications: author, year, type of study, inclusion criteria, age of participants, type of cartilage defect, n per group, total n, results and conclusions .

Information synthesis

The evaluation of the literature and the synthesis of the information was carried out in tables based on Cochrane recommendations (10) .

Results

Characteristics of the included studies

With the established search criteria, a total of 123 records were identified, of which 45 duplicate records were eliminated and 81 abstracts were reviewed to identify original articles that reported information of interest. Of the 81 full-text summaries, 11 were chosen by review of abstracts, which were reviewed in full text to extract the information of

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interest and in the final analysis a total of 10 studies that reported pain or sleep quality in patients were included. with rotator cuff injuries (Figure 1).

All included studies were conducted from 2015 onwards; Of the 10 articles included, 5 were carried out in the United States, 2 in Turkey, 2 in Italy and one in Korea. In total, the studies included a total of 1516 patients with rotator cuff injury, 8 of the 10 studies were cohort and 2 were cross-sectional-analytical. The average age of the patients ranged between 57 and 66 years, and the proportion of affected men was slightly lower than that of women. Three studies did not report the treatment of the patients, while 7 studies did report the treatment offered to the patients. The minimum follow-up of the patients was 6 months and the maximum was more than 24 months (11–20) .

The pain measurement scales were the visual analogue scale (VAS) in 4 studies; the Elbow Surgeons Scale (ASES) scale in 4 studies; and the Oxford Shoulder Score (OSS) in 2 studies and the Constant-Murley Score (PCM) in one study (11–20) . To evaluate sleep quality, the Pittsburgh Sleep Quality Index (PSQI) was used in the 10 studies and the Epworth Sleepiness Scale in one study (11–20) .

Night pain in patients with rotator cuff injury and pain intensity

Only two studies reported the frequency of pain in patients with rotator cuff injury, with Khazzam reporting that 91% of participants reported night pain (17) and Mulligan that 93% had night pain (20) . That is, night pain is present in the majority of patients with rotator cuff injury.

Regarding pain intensity, the pain was on average of moderate intensity with mean scores slightly higher than 5.5 points on the VAS prior to treatment (11–20) .

Sleep quality in patients with rotator cuff injury

Regarding sleep quality, all studies reported that rotator cuff injury was associated with alterations in sleep quality (11–20) . One study reported that altered sleep quality was related to a larger tear size (18) , but another study found greater sleep disturbance in small tears (13) and another found no relationship between injury characteristics and sleep disturbances (16) . Therefore, the relationship between the size and characteristics of the lesion and sleep disturbances is not clear.

Changes in pain and sleep quality after treatment

After treatment, all studies in which follow-up was carried out reported significant decreases in pain to scores of 2 points or less at 12 and 24 months post-operatively. The lowest average score reported was 1.3 VAS points (11–20) .

All studies that followed up on patients reported that the surgical treatment produced an improvement in the quality of sleep in the patients, as could be demonstrated by a significant decrease in the PSQI score in the post-operative period at each of the evaluated moments (11–20) . In one study it was reported that only a third of patients continued to have sleep disturbances 6 months post-operatively (11) .

Association of pain with alterations in sleep quality

Regarding the association of nocturnal and non-nocturnal pain with sleep quality, the results were variable; While Mulligan, Chao and Reyes did not find an association between pain and sleep quality (12,16,20) , other authors such as Horneff and Khazzam found a correlation of pain scores with sleep quality scores (15,17) .

Shoulder functionality

Some studies reported shoulder functional measurements such as the Constant-Murley score (PCM), the Oxford Shoulder Scale, or the Comprehensive and Comparable Assessment of Shoulder Function (CSS). These studies demonstrated shoulder functional alterations that improved after rotator cuff repair. Also, they reported an association between functionality and sleep quality (14,15,18,19) .

Discussion

Nocturnal and non-nocturnal pain in rotator cuff injury

Although it has been reported in the classic literature that pain from rotator cuff injuries occurs at night, only two of 10 studies found reported nocturnal pain at a frequency greater than 90% (17,20) . This indicates that, although there is no custom of reporting the frequency of night pain, this manifestation is present in the majority of patients and therefore should be a goal for improvement and an outcome to be measured in patients with rotator cuff injury.

The reduction in pain in all studies where pain is reported as an outcome indicates that surgical treatment when there is an injury or tear of the rotator cuff induces a significant reduction in pain, going from moderate-severe pain to mild pain, since the scores pain according to the VAS are reduced from 5-6 points on average to 2 points or less, so it is evident that surgical treatment reduces pain associated with rotator cuff injury (11-16,18,19) .

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Sleep quality in rotator cuff injury and its association with pain

The deterioration of sleep quality is clear in patients with rotator cuff injury, since all included studies report it (11–20) . Furthermore, it is a parameter that can be completely improved in patients with surgical treatment, since the scores are significantly reduced after management (11–20) . Although not all studies report the proportion of patients who achieve improvement in sleep quality, improvement in sleep quality occurs in at least 2 thirds according to one of the studies (11) .

Although old literature reports that nocturnal shoulder pain is responsible for alterations in sleep quality in patients with rotator cuff injury (13) , the reports found in this systematic review indicate that sleep alterations They seem multifactorial and not simply a product of nocturnal pain. In fact, three studies did not report an association between pain and sleep quality (12,16,20) , but two did find a relationship (15,17) . Certainly, nighttime pain plays a role in sleep disturbance, but there are other factors involved including sling use, shoulder stiffness, functional deficits, and inability to position properly at night (11) . In fact, several studies found that sleep quality is closely related to the shoulder functionality perceived by the patient, as demonstrated by the correlation between pain scale scores and Oxford Functionality Scales (OSS), the Constant-Murley (PCM) and the Comprehensive and Comparable Assessment of Shoulder Function (CSS) (11–20) .

Therefore , the evidence available to date indicates that alterations in sleep quality are not only due to nocturnal pain in patients with rotator cuff injury, but also to alterations in shoulder function (11–20) .

Conclusion

This systematic review provides evidence that night pain affects more than 90% of patients with rotator cuff injury, that all patients have alterations in sleep quality, and that surgical management of the injuries reduces pain and Improves quality of life. The available evidence indicates that alterations in sleep quality are not only due to pain but to other factors including shoulder functionality.

Conflicts of interest

The author declares no conflict of interest.

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