Original Article

Rotator Cuff Tears Are Related to the Side Sleeping Position

David P. Richards, M.D., F.R.C.S.C., Daniel L. Miller, M.D., E. David MacDonald, B.Sc.P.T., M.B.A., Quinn F. Stewart, B.Sc., and Stephen D. Miller, M.D., F.R.C.S.C.

Purpose: To determine whether there was a relationship between sleep position and symptomatic partial- and full-thickness rotator cuff tears. **Methods:** A consecutive series of patients that met the inclusion/exclusion criteria (n = 58) were in seen in clinic between July 2019 and December 2019. All of these individuals had a significant partial-thickness (> 50%) or full-thickness rotator cuff tear determined by either ultrasound, magnetic resonance imaging, or both. All patients in this series either had an insidious onset of shoulder pain or their symptoms were related to the basic wear and tear of daily activities. Traumatic rotator cuff tears (those associated with a significant traumatic event such as shoulder instability, motor vehicle accidents, sports related injuries, etc.) were excluded. Previous shoulder surgery, recurrent rotator cuff tears, and worker's compensation cases also were excluded from this series. As part of the history-taking process, the patients were asked what was their preferred sleeping position—side sleeper, back sleeper, or stomach sleeper. A χ^2 test was conducted to determine the relationship between rotator cuff pathology and sleep position. **Results:** Of the 58 subjects, 52 of the patients were side sleepers, 4 were stomach sleepers, 1 was a back sleeper, and 1 preferred all 3 positions. Statistical analysis, using the χ^2 test ($P < .0001$), demonstrated that rotator cuff tears were most often seen in side sleepers. **Conclusions:** In our study, there appeared to be a relationship between the preference of being a side sleeper and the presence of a rotator cuff tear. **Level of Evidence:** Level IV, prognostic case series.

The rotator cuff (RC) is a collection of 4 shoulder girdle muscles and their respective tendons that are integral in the normal function of the glenohumeral joint. It is the primary dynamic stabilizer of the glenohumeral joint and plays an essential role in shoulder function and mobility.[1,2] Chronic shoulder pain is a major source of musculoskeletal disability, affecting 8% of the population, and is second only to chronic knee pain in how it affects the aging general population.[3-5] Other studies suggest that RC injuries are common in the general population, with a prevalence ranging between 6% and 39%.[6-11] The prevalence is even greater in those individuals older than 50 years of age, with some studies demonstrating RC tears exceeding 50% in individuals older than 80 years.[10,11] This pathology can be poorly diagnosed and mistreated, resulting in pain, loss of function, and even pseudoparalysis.

Imaging is essential in the diagnostic work-up of patients with significant, either acute or chronic, shoulder pain. The 2 most common methods for diagnosing RC tears are magnetic resonance imaging (MRI) and ultrasound imaging. Both have demonstrated high accuracy, sensitivity, specificity, and positive predictive value in diagnosing full-thickness RC tears.[12-15] Not only does imaging allow for the diagnosis of RC pathology, it assists in surgical planning.[16,17]

The prevailing consensus is that RC tears are a result of trauma or degenerative changes. The exact etiology of degenerative RC tears is unclear.[18] Only a small percentage of tears will heal, whereas a majority of tears will continue to propagate and progress over time.[19-21] The lack of healing that occurs, and subsequent progression of the tear, is thought to be at least a

From West Virginia University — Eastern Division — Charles Town, West Virginia, U.S.A. (D.P.R.); and Rocky Mountain Health — Calgary, Alberta, Canada (D.P.R., D.L.M., E.D.M., S.D.M.).

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Address correspondence to David P. Richards, M.D., F.R.C.S.C., Orthopaedic Surgery, West Virginia University, 912 Somerset Blvd. Suite 101, Charles Town, West Virginia, 25414, U.S.A. E-mail: scopedr@gmail.com

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consequence of possible poor vascularization of the torn RC.[7,22-26] Factors that can affect vascular supply certainly do result in adverse RC healing.[27,28]

In addition to the commonly discussed risk factors of age, diabetes, body mass index (BMI), and smoking, sleep position has gained traction in recent years as a potential risk factor.[27-34] Night pain is a common complaint of patients with shoulder pain, and it is well documented that RC pathology often disrupts the sleep of those affected.[35,36] The question becomes: what effect do sleep habits have on RC pathology? Since one-third of an individual's life is spent sleeping, the preferred sleeping position has the potential to substantially influence joint pathology.[34,37] Specifically, the relative lack of movement during sleep, especially during the aging process, has the potential to increase the pressure on or within the shoulder joint in certain body positions, leading to degenerative changes.[32,37] It has been demonstrated that the decubitus position results in the most subacromial pressure when compared with the other common sleep positions.[34] Additional studies have discovered a potential link between the decubitus position and RC pathology.[32,33,38,39] The purpose of this study was to determine whether there was a relationship between sleep position and symptomatic partial-and full-thickness RC tears. It was hypothesized that a majority of patients with both full-thickness and partial-thickness tears would be preferential side sleepers.

Methods

This was a retrospective review that received approval from the West Virginia University Institutional Review Board (2007061276) and also the executive/research group at the Rocky Mountain Health Clinic. The patients were seen at Rocky Mountain Health (Calgary, Alberta, Canada) between July 2019 and December 2019. The inclusion criteria required that all patients have a documented RC tear based on MRI, ultrasound, or both. Partial-thickness tears were only included in the study if >50% of the tendon thickness was involved based on diagnostic imaging. The onset of the patient's symptoms had to be insidious in nature—related to the regular/normal activities of daily living. All patients with traumatic RC tears (those associated with a significant traumatic event, such as shoulder instability, motor vehicle accidents, sports related injuries, work related injuries, etc.) were excluded from this study. Patients with recurrent RC tears and RC arthropathy also were excluded from participating in this study. Finally, all worker's compensation cases also were excluded from this study. As part of the history-taking process, the patients were asked what was their "preferred sleeping position—side sleeper, back sleeper or stomach sleeper." A total of 58 patients met the inclusion/exclusion criteria during that period of time. A χ^2 statistical analysis (R, Version 4.03; R Foundation for Statistical Computing, Vienna, Austria) was conducted to determine the relationship between RC pathology and sleep position.

Results

There was a total of 58 patients who comprised our study. In total, 32 of the participants were male and 26 were female. The mean age of the subjects was 60.3 ± 1.3 years old. A total of 48 individuals were right-handed, 6 were left-handed, and 4 were ambidextrous. Fifty of the patients had an ultrasound that demonstrated an RC tear, and 25 patients had an MRI with evidence of a RC tear. In total, 51 patients had a full-thickness RC tear. A significant partial-thickness RC tear was seen in 7 of the participants. A RC tear was noted in 40 right shoulders and 18 left shoulders. A majority of the individuals in this study were side sleepers. In total, 52 of the participants described themselves as being a side sleeper. The stomach sleepers constituted 4 of the 58 subjects. There was only one individual who preferred sleeping on their back. Finally, one of the patients stated they preferred a combination of all 3 positions to sleep. The results are summarized in Table 1.

A statistical analysis was performed to see if any relationship existed. A χ^2 test ($P < .0001$) was performed on our data. Our statistical analysis demonstrated that there was a significant relationship between the side-sleeping position and RC pathology in our study.

Discussion

In this study, we found a significant relationship between side sleeping and RC tears. We found that 89.7% of our patients who had RC tears preferred the lateral decubitus position or were side sleepers. Cabuk et al.[38] performed a similar study to us. They evaluated 87 patients who had sought medical attention for insidious-onset shoulder pain and compared them with a control group with no shoulder pain. The average in their study group was 63.99 ± 8.89 years, which was very similar to our patients (60.3 ± 1.3 years old). MRI scans were done in both groups. A total of 40 (46%) of their patients had partial rupture and 47 (54%) had a complete tear based on MRI evaluation. It is not clear from their study how the number of RC tears were distributed between the study and control groups. The authors do state that 83.9% of their study group that had RC pathology preferred the lateral decubitus position for sleeping compared with 61.3% for their control group.

Generally, RC tears are a problem associated with the aging process. Numerous studies have demonstrated that as individuals age, there is a greater likelihood of developing an RC tear. The prevalence is

Table 1. Relevant Study Data

	Sleep Study Rotator Cuff Patients
n	58
Age, y	60.3 ± 1.3
Sex	
Male	32 (55.2%)
Female	26 (44.8%)
Handedness	
Right-handed	48
Left-handed	6
Ambidextrous	4
Imaging	—
	—
Patients undergoing MRI	25
Patients undergoing ultrasound	50
Type of tears	—
	—
Patients with full-thickness tear	51
Patients with partial-thickness tear	7
Sleep position	
Side sleepers	52
Stomach sleepers	4
Back sleeper	1
All 3 positions	1

MRI, magnetic resonance imaging.

greater as individuals enter into their sixth decade.[3-11] The average age of the subjects in our study was 60.3 ± 1.3 years old. This coincides with the established literature and what is generally seen anecdotally in clinic.

Night pain with sleep difficulties is a common complaint of patients with shoulder pathology. It is well documented that RC pathology often disrupts the sleep of those affected.[35,36] Ansok et al.[35] demonstrated that individuals with full-thickness RC tears had greater sleep disturbances, poorer sleep quality, shorter sleep duration, frequent awakenings, and decreased sleep efficiency. Kunze et al.[36] also demonstrated that individuals with RC pathology had a high prevalence of poor-quality sleep that seemed to improve after RC repairs. In their systemic review, Barandiaran et al.[39] demonstrated that shoulder surgery helped resolve preoperative sleep disturbances in patients with shoulder pathology.

Since we spend about one-third of our lives sleeping, preferred sleeping position has the potential to significantly influence joint pathology.[34,37] Zenian[32] postulated that shoulder pain occurs on the patient's preferred to side on which to sleep. Specifically, the relative lack of movement that occurs during sleep, especially with age, has the potential to increase the pressure on the shoulder joint in certain body positions, leading to degenerative changes, such as RC tears.[32,37] Skarpsno et al.[37] in their large study of a working Danish population found that the participants spent 54.1% of the time in the side position. They noted that with increasing age and BMI, patients tended to prefer sleeping in the side position. They noted that women, individuals with increased BMI, and smokers tended to move less while they slept. They also noted that side preference for sleeping increased with age. Kempf and Kongsted[33] also demonstrated in their study that the side of the shoulder pain was associated with the side the patient slept on. In our study, 52 of 58 individuals were side sleepers, which firmly demonstrates that preferential side sleeping leads to shoulder pain and possible pathology.

Werner et al.[34] demonstrated the subacromial pressures were significantly lower in participants sleeping in a supine position than those subjects that slept in the side or prone positions. They demonstrated that the decubitus position results in the most subacromial pressure when compared with the other common sleep positions.[20] They postulated that this may affect tissue/tendon perfusion. The lack of healing that occurs and subsequent progression of RC tears has been theorized to be a possible result of poor tissue vascularity of the RC.[7,22-28] Perhaps prolonged positioning in the lateral decubitus position while we are asleep causes perfusional changes within the RC tendons that leads to further attritional changes.

Limitations

The etiology of RC pathology is multifactorial with the commonly discussed risk factors of age, diabetes, BMI, and smoking are commonly noted, but sleep position has become of greater interest recently as a potential risk factor.[27-34] Shoulder pain at night is a common complaint with shoulder patients, and it is well documented that RC pathology often disrupts the sleep of those affected.[35,36] The question becomes: what effect do sleep habits have on RC tears? This study may not fully answer this question, but it demonstrates that sleep position needs further evaluation to determine the common complaint of night pain and sleep position in patients with RC pathology. However, there are limitations with this study. First, the number of patients who met our inclusion criteria was small. Second, the study only focused on preferred sleep position. It did not take into consideration the fact patients may move through various positions throughout their sleep. Although as patients age they tend settle into a more constant and preferred sleep position, their preferred position may have evolved throughout their lives.[37] This study lacks a control group that may have provided further clarity with regard to sleep position and RC pathology.

Conclusions

In our study, there appeared to be a relationship between the preference of being a side sleeper and the presence of a RC tear.

Disclosure

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: D.P.R. reports statistical assistance, provided by West Virginia University School of Medicine and a relationship with Arthrex that includes: consulting or advisory and speaking and lecture fees. D.L.M. reports administrative support, provided by Rocky Mountain Health. E.D.M. reports administrative support, provided by Rocky Mountain Health. Q.F.S. reports writing assistance, provided by Rocky Mountain Health. S.D.M. reports administrative support, provided by Rocky Mountain Health Care. Full ICMJE author disclosure forms are available for this article online, as supplementary material.

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