The Effects of Obstructive Sleep Apnea Risk on Post-Operative Recovery Following Rotator Cuff Repair

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Introduction

Rotator cuff injuries are the most common tendon injury in the adult population affecting nearly 30% of adults over the age of 60 years[6]. Upwards of 35% of patients experiencing a rotator cuff tear will develop substantial pain and inability to perform basic daily tasks[6,8]. Treatment of rotator cuff injuries can be complex as several factors must be considered, such as: tear thickness, size, and morphology. However, it has been consistently shown in the literature that surgical intervention, specifically rotator cuff repairs (RCR), results in greater long-term patient outcomes[8] compared to conservative treatment.

Another common pathology among older adults is obstructive sleep apnea (OSA). OSA is a condition that is characterized by repeated episodes of respiratory pathway obstruction throughout a period of sleep[1]. These continuous bouts of upper airway obstruction result in irregular sleep patterns that leave the individual experiencing excessive day-time sleepiness, often combined with morning headaches[1]. The reported prevalence of OSA in higher-income countries such as the United States has increased over time[1].

Due to the increasing prevalence of OSA rates in higher income countries, combined with the overall prevalence of rotator cuff injuries, the combination of the two in relation to post-operative healing and rehabilitation is likely intertwined as well as highly relevant to orthopedists treating rotator cuff injuries. There remains a scarcity in the literature as to how obstructive sleep apnea affects post-operative healing and rehabilitation following rotator cuff repair.

Purpose

The purpose of this study was to determine whether patients at high risk for OSA experience worse outcomes after surgical treatment for rotator cuff repair via a retrospective cohort study.

Methods

Included patients completed STOP-BANG surveys in which scores greater than 3 were considered high risk for OSA as per standard guidelines (Chung 2016). Five mixed model repeated measures ANCOVAs were performed for five different outcome measures: VAS pain scores, SANE scores, VR-12 mental and physical scores, and total ASES scores, measured pre-operatively, 3 months, 6 months, and 1 year post-operatively.

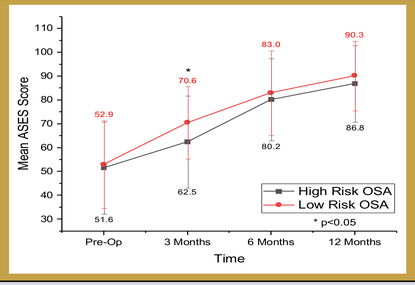
Results

There was a significant group by time interaction for the VR-12 mental scores ($F = 3.66$, $p = .0128$): scores consistently increased over time for patients at high risk of OSA, while patients at low risk of sleep apnea did not exhibit a significant difference post-operatively. There was a significant group effect, time effect ($F = 56.59$, $p < .0001$), group by time interaction, and effect of BMI on the VR-12 physical scores. Patients at high risk of OSA had on average lower scores by 3.35 points ($F = 7.27$, $p = .0076$). While scores increased on average over time for patients at low risk and high risk of OSA, patients at low risk showed a quicker and greater improvement overall ($F = 4.36$, $p = .005$), while patients with a higher BMI performed significantly worse ($F = 6.76$, $p = .01$).

Limitations

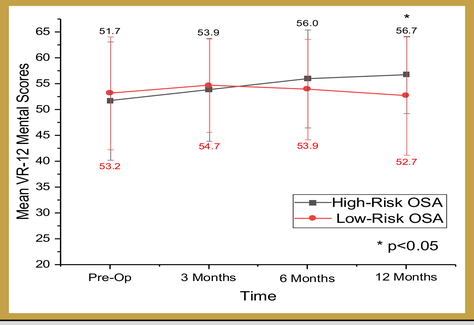
Our results are limited due to its retrospective nature as complete outcome measures across all study timepoints was not available for consecutive patients. Other limitations include the construction of a cohort derived from multiple surgeons that included all rotator cuff tear patients with a variety of RCR methods, whether due to surgeon preference or indication at the time of surgery. Lastly, our use of the STOP BANG score as our measure for OSA prevalence is a limitation, while the questionnaire has a high reliability, it cannot diagnose OSA.

Figure 1. High-risk OSA patients report significantly worse ASES score at 3 months post RCR



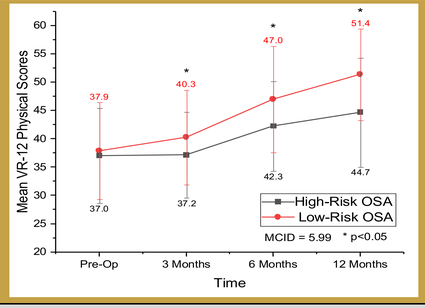
*=p<.05 Graph depicts the average total ASES scores at each time-point. As expected, mean ASES scores improved post-operatively compared to pre-operatively for both groups ($p < .0001$). 3-month scores were also significantly lower for patients at high risk for OSA (62.47 vs. 70.58, $p = .0079$), and average scores for female patients were lower overall (61.386 vs. 67.996, $p = .0046$).

Figure 2. Mean VR-12 mental health scores significantly improved at 12 months post-RCR compared to pre-RCR



Graph depicts the average VR-12 mental scores at each time-point. There was a significant group by time interaction for the VR-12 mental scores ($p = .0127$).

Figure 3. Mean VR-12 physical health scores significantly improved for high-risk OSA patients across 12 months post-RCR as well as compared to low-risk OSA patients.



Mean VR-12 physical scores for patients at high and low risk of OSA pre and post RCR depicts a significant group effect, time effect, as well as a group by time interaction effect ($p = .0071$, $p < .0001$, and $p = .0049$, respectively). * denotes p-value <.05

Discussion

RCR in patients at high-risk of OSA can expect similar improvements in PROs of shoulder function and shoulder pain; while in some cases, greater improvements in mental health at 1 year post-operatively, compared to their low-risk counterparts.

In addition, patients at high-risk of OSA may not improve as rapidly in terms of shoulder function as their low-risk counterparts as evidenced by significantly lower ASES scores at the 3-months post-operative mark. On that note, this finding was not seen when comparing SANE and VAS scores between our study groups at any timepoint. We speculate it is indicative of an underlying difference in shoulder function and its downstream effects on acts of daily living rather than shoulder pain.

Furthermore, our results also demonstrated that high-risk of OSA patients had significant improvements in mental health at 1 year post-operatively compared to pre-operatively, which was not observed in the low-risk OSA group. When taken together, the significant improvement in VR-12 mental scores may explain significantly lower ASES scores in the high-risk OSA group at 3 months post-operatively. While both groups showed significant improvement in VR-12 physical scores, only the low-risk OSA group demonstrated vastly greater improvements in physical health when compared to their high-risk counterparts.

We speculate that these improvements in VR-12 physical and mental health may be an indirect measure of improvement in sleep quality that has been previously shown in the literature to be poor in RCT patients[2,4]. We hypothesize that there may be an underlying compounded effect of OSA and shoulder-related sleep disturbance creating even poorer sleep quality in RCT patients in the high-risk OSA group at the pre-operative stage. Taken together, further research is needed to determine if improvements in sleep quality are achievable even in patients with undiagnosed or untreated OSA.

Conclusion

Our findings suggest that RCR in patients at high-risk of OSA can expect similar improvements in PROs of shoulder function and shoulder pain; while in some cases, greater improvements in mental health at 1 year post-operatively, compared to their low-risk counterparts. However, in contrast to their low-risk counterparts, our results suggest that patients at high risk of OSA cannot expect similar improvements in physical health one-year post RCR. Hence, orthopedists should take into consideration that while high-risk OSA patients can anticipate achieving similar levels of recovery following RCR, their progress towards these results may be markedly slower for certain parameters of recovery.

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