**Does Scapulothoracic Elevation Affect Acromial Impingement Stress in Lateralized Reverse Total Shoulder Arthroplasty?**

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## Summary

This study provides a comprehensive overview of the interaction between various scapulohumeral rhythms (SHRs)—defined as the ratio of glenohumeral to scapulothoracic elevation—and acromial impingement stress, highlighting the potential for mitigating acromial impingement by enhancing the scapulothoracic contribution in lateralized reverse total shoulder arthroplasty (RTSA).

## Introduction

Lateralized RTSA can improve joint stability and reduce scapular notching [1]. However, this prosthesis decreased acromiohumeral distance (AHD) [2], potentially leading to acromial impingement during abduction [3]. Although alterations in scapulothoracic elevation can affect AHD during abduction [4], it remains unclear how these changes influence acromial impingement in lateralized RTSA. Therefore, this study aimed to investigate the effect of various SHRs on acromial impingement stress in lateralized RTSA.

## Methods

Ten male *in vivo* experimental datasets (age: 25.0 ± 2.4, weight: 78.0 ± 7.8 kg, height: 175.4 ± 5.8 cm), collected during 120° abduction in the scapular plane, were used as inputs for a musculoskeletal shoulder model of lateralized RTSA (Coralis® Reverse Shoulder System; Corentec Co., Ltd., Seoul, Republic of Korea). Five SHRs—1.2:1, 1.5:1, 1.7:1, 2.2:1, and 2.4:1—were simulated using the RTSA model [5–9]. A repeated-measures ANOVA was conducted to determine differences between the lateralized RTSA models. Post hoc paired t-tests with Bonferroni correction were performed to compare peak acromial impingement stress.

## Results and Discussion

When SHR was 2.4:1, peak acromial impingement stress increased significantly by 113.7% ($P < 0.001$), 131.5% ($P < 0.001$), 103.8% ($P < 0.001$), and 23.7% ($P < 0.001$), respectively, compared with values at SHRs of 1.2:1, 1.5:1, 1.7:1, and 2.2:1 (Figure 1). Similarly, when SHR was 2.2:1, peak acromial impingement stress increased significantly by 72.8% ($P = 0.002$), 87.2% ($P < 0.001$), and 64.8% ($P < 0.001$), respectively (Figure 1). There were no significant differences among SHRs of 1.2:1, 1.5:1, and 1.7:1.

Acromial impingement in lateralized RTSA could adversely affect postoperative clinical outcomes [10]. The results of this study showed that SHRs of 2.4:1 and 2.2:1 significantly increased acromial impingement stress during abduction in lateralized RTSA.

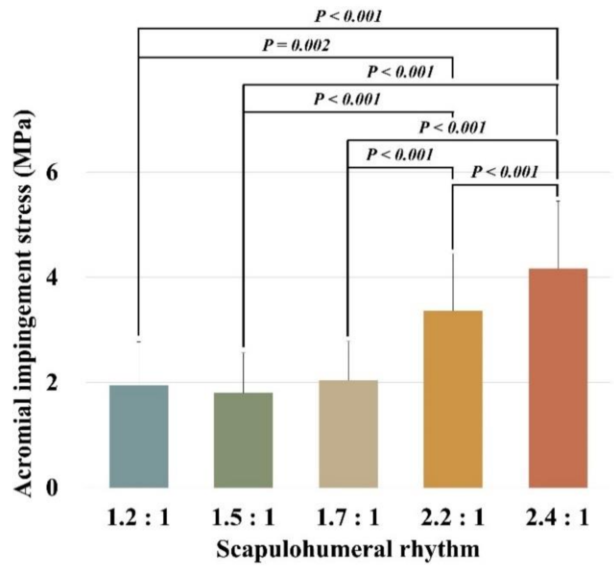


**Figure 1**: Comparison of peak acromial impingement stress across scapulohumeral rhythms during abduction in lateralized reverse total shoulder arthroplasty.

## Conclusions

This study suggests that enhancing the scapulothoracic contribution can help mitigate acromial impingement stress in lateralized RTSA.

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