Kinematics of the Shoulder Complex After Reverse Total Shoulder Arthroplasty

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Introduction

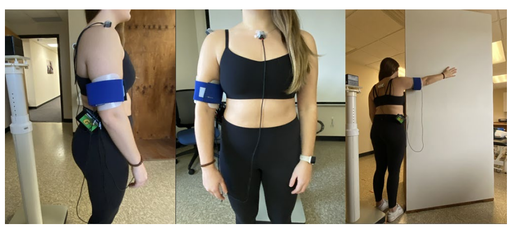
Background: The reverse total shoulder arthroplasty (rTSA) is a common surgical intervention to address massive rotator cuff tears concurrent with glenohumeral osteoarthritis.[1,2] Kinematics following rTSA have been thoroughly studied, demonstrating significant improvements in gross movement outcomes of the shoulder, specifically functional upper extremity elevation.[3] However, the correlation between shoulder kinematics and patient-reported function of the surgically reversed shoulder joint are not well understood.

Purpose: To determine the relationship between shoulder complex osteokinematics and the Disabilities of the Arm, Shoulder, and Hand (DASH) after rTSA

Methods

Participants:
- 15 participants (7 males, 8 females)
- Average age: 75.3 years
- Minimum 12 months status post rTSA

Tests and Measures: The Pohemus G4 3D electromagnetic motion capture system[4] was utilized to capture humeral and scapular osteokinematics. Participants completed three repetitions of upper extremity elevation in three different planes of motion: the sagittal plane, frontal plane, and a plane 45 degrees anterior of the frontal plane.



Data Analysis: Spearman Correlation

Results

The median DASH score was 12.5 (minimum 1.7, maximum 41.6). Moderate correlations were found between DASH scores and abduction (r = -0.50, p=0.06) as well as DASH scores and scapular plane elevation (r = -0.47, p=0.08).

	r	p		r	p		r	p
ABD	-0.50	0.06	**SCAP**	-0.47	0.08	**FLEX**	-0.31	0.26
UR	0.22	0.42	**UR**	0.12	0.67	**UR**	0.06	0.84
PT	-0.17	0.55	**PT**	-0.13	0.65	**PT**	-0.12	0.67
IR	-0.13	0.66	**IR**	-0.14	0.63	**IR**	-0.25	0.38

Table 1. Spearman correlation and significance values between DASH scores and osteokinematic variables. r = Spearman's rho, ABD = abduction, FLEX = flexion, SCAP = scapular plane elevation, IR = internal rotation, PT = posterior tipping, UR = upward rotation.

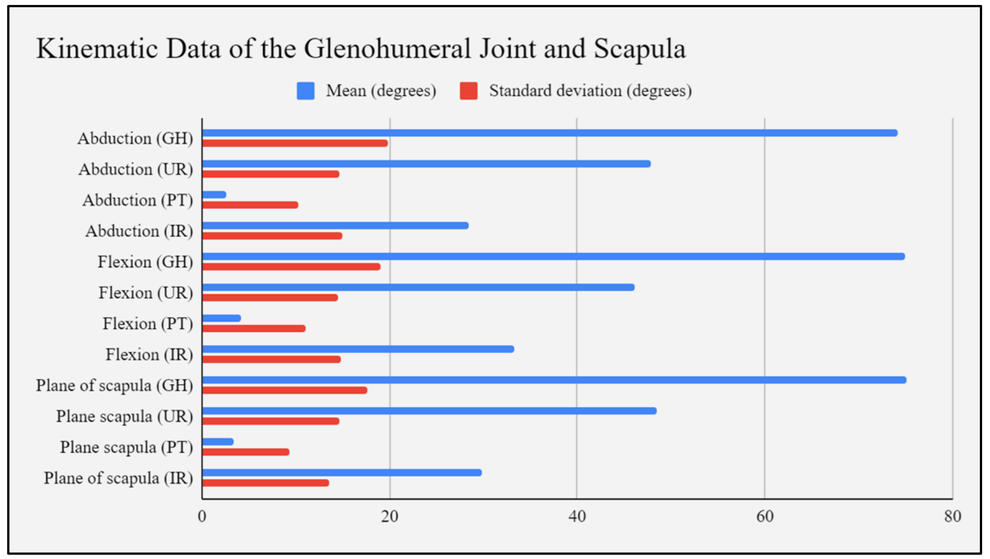


Figure 2. Means and standard deviations of humeral elevation and scapular kinematics after a reverse shoulder arthroplasty. GH = glenohumeral.

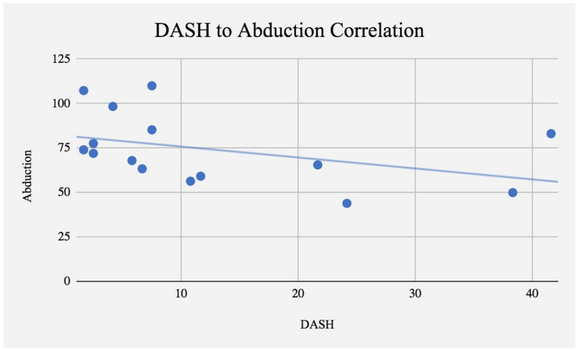


Figure 2: Scatterplot with best-fit line demonstrating the relationship between GH abduction and DASH scores.

Conclusion

The DASH is a patient-reported outcome measure that allows for the consideration of the completion of activities with either extremity. Future research should utilize an outcome tool that accounts for unilateral reporting, allowing data collection specific to the post-operative side. This may contribute to a better understanding of scapular osteokinematics and the relationship to the selected outcome measures.

Clinical Relevance

Though the moderate correlations between DASH scores GH elevation into abduction and the plane of the scapula did not reach significance, the scapula and its actions should not be neglected in rehabilitation after rTSA.

Acknowledgments

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References

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