

Does Cortical Activation Hold The Key To Shoulder Instability?

Orthopaedics / Shoulder & Upper Arm / Epidemiology, Prevention & Diagnosis

Anthony Howard¹, Joanne Powell², Jo Gibson³, David Hawkes³, Omid Alzadehkhayat⁴, Graham Kemp⁵

1. Leeds University, Leeds, United Kingdom
2. Edge Hill University, Edge Hill, United Kingdom
3. Royal Liverpool Hospital, Liverpool, United Kingdom
4. Hope University, Liverpool, United Kingdom
5. Liverpool University, Liverpool, United Kingdom

Keywords: Shoulder Instability, FMRI, Cortical Activation

Background

Neuroimaging offers clinically relevant insights into orthopaedic conditions that are poorly understood. We investigated a group of patients with shoulder instability that is caused by muscle patterning and atraumatic structural issues.

Objectives

The objective was to observe the cortical activation of both the patient and the control group.

Study Design & Methods

We recruited 16 patients with shoulder instability (Polar Type II/III – Standmore Triangle) and 16 age matched controls. Both groups underwent Functional Magnetic Resonance Scanning whilst undertaking simple shoulder movements and Diffusion-weighted magnetic resonance imaging. The Oxford Instability Shoulder Score and Western Ontario Shoulder Instability Index was completed by both groups.

Results

The patient group overall had higher levels of activation within both their white and their grey matter. In the motor cortex we identified an area of activation unique to the patient group ($p < 0.001$). In the white matter the neutral tracks of the patient group were different ($p < 0.013$). The variation is particularly concentrated in the corpus callosum, which is the interconnection area of the premotor, supplementary motor and motor cortex.

Conclusions

The work for the first time demonstrates that the pathophysiology of these patients is very different, that there is a fundamental difference in the cortical activation of shoulder movement in these patients. We suggest that these cortical activations are evidence of a simultaneous provoking and compensatory strategies to maintain a fragile stability.

This builds on other work that has identified differences in other patient groups with movement dysfunction, such as Dystonia. In such conditions biofeedback techniques have enabled cortical activation patterns to be changed as a therapeutic intervention.