Fatty Infiltration of the Cervical Multifidus Musculature is Associated with Clinical Disability in Cervical Spondylotic Myelopathy: a prospective, case-control series

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Introduction

Cervical spondylotic myelopathy (CSM) is among the most common spinal cord disorders of the elderly. Muscle fat infiltration (MFI), the pathological infiltration of fatty tissue into muscle, is known to contribute to pain and disability following in a variety of neurologic and spinal pathologies [1-3], but has never been studied in patients with CSM. We examined the relationship between MFI and clinical disability from CSM.

Methods

We prospectively enrolled nine CSM patients and five aged-matched controls to undergo MRI imaging of the cervical spine with MFI. A 3 Tesla, 3 dimensional dual-echo gradient echo acquisition was performed to collect fat and water data for the neck multifidi muscles (C3–C7) to calculate MFI. A blinded investigator manually traced regions of interest for each of the bilateral multifidii muscles from C3 to C7 on fat-water MRI images to calculate MFI percentages. Nurick scores and modified Japanese Orthopedic Association scores were collected for all patients.

Results

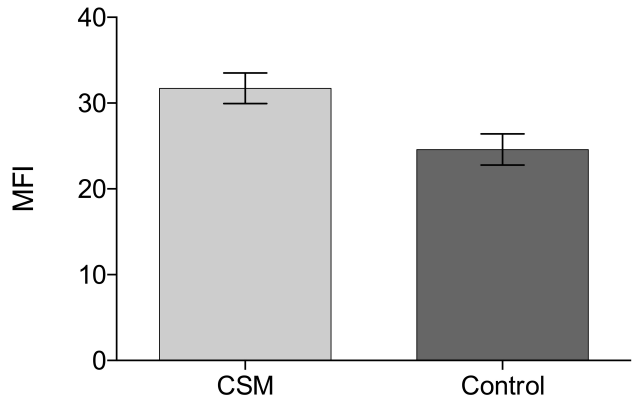
CSM patients and controls were equivalent with respect to age, height, weight, gender, race, smoking status, and employment status. CSM patients and controls differed with respect to both mJOA scores (14.6±0.6, 18.0±0.0, p=0.0017) and Nurick scores (1.9±0.3 v. 0.0±0.0, p=0.0008). MFI was higher in patients with CSM than in controls (31.7% v. 24.6%, respectively, p=0.0178). MJOA scores correlated linearly with MFI (R=0.542, p=0.0453). Higher MFI was associated with increased disability on the Nurick scale (p=0.0371).

Conclusions

Learning Objectives

- Muscle fat infiltration (MFI), the pathological infiltration of fatty tissue into muscle, may contribute to pain and disability in patients with CSM.
- Patients with CSM have higher levels of MFI than age-matched controls.
- Increased MFI of the multifidus muscles is associated with clinically significant changes in mJOA and Nurick scores.
- Spinal injury in CSM may lead to secondary muscle loss and muscle fat infiltration

Figure 1 - MFI in CSM v. Controls



Muscle fat infiltration of the multifidus muscle among patients with cervical spondylotic myelopathy and age-matched controls.

References

[1] Elliott J, Jull G, Noteboom JT, Darnell R, Galloway G, Gibbon WW. Fatty infiltration in the cervical extensor muscles in persistent whiplash-associated disorders: a magnetic resonance imaging analysis. Spine. 2006;31:E847-E55. 0362-2436.

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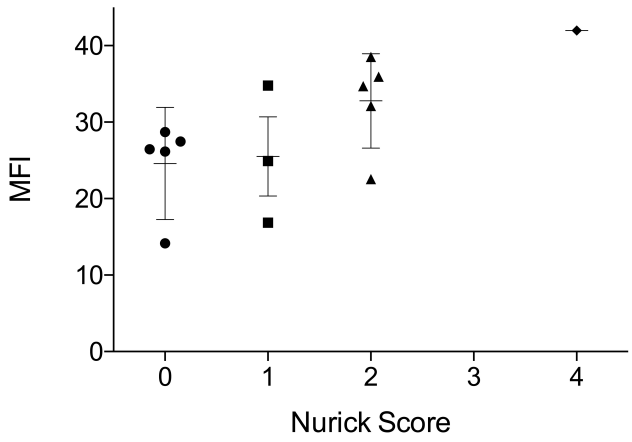
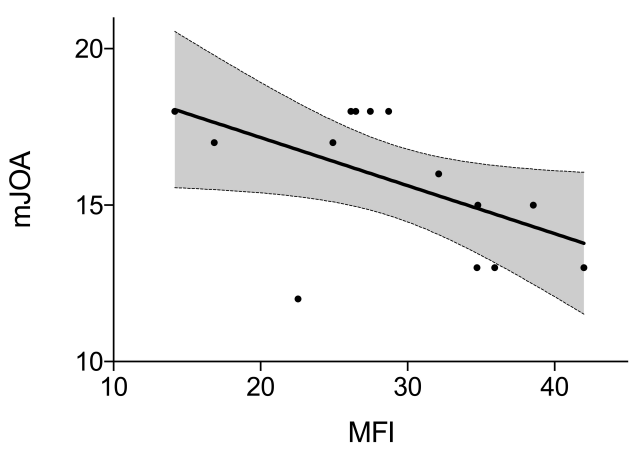
Figure 2 - MFI and Nurick Scores



Increased muscle fat infiltration of the multifidus muscle was associated with more disability, as measured by Nurick Score (p = 0.0371).

Figure 3 - MFI and mJOA scores



Muscle fat infiltration was found to be linearly correlated with modified Japanese Orthopedic Association scores (p = 0.0453, R = 0.542). The figure depicts both the best-fit line and its 95% CI.