The Anterior-Posterior Balance of the Cervical Paraspinal Muscles in Dropped Head Syndrome and Cervical Spondylotic Myelopathy

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Disclosures: Takashi Sono (JSPS KAKENHI Grant number JP24K19575)

Abstract

Introduction: Dropped head syndrome (DHS) is characterized by weakness of the neck extensor muscles. However, few studies have assessed the cross-sectional areas (CSAs) of the cervical paraspinal muscles (CPM) and their anterior-posterior balance in DHS. This study aimed to elucidate the pathognomonic findings of DHS by comparing the CSAs and anterior-posterior balance of the CPM in patients with DHS and cervical spondylotic myelopathy (CSM), using magnetic resonance imaging (MRI).

Methods: We compared the CSAs and anterior-posterior balance of the CPM in patients with DHS and CSM using MRI (Figure1 and 2). Patients with CSM were selected in an age- and sex-matched manner, using the propensity score. The longus colli (LC) muscle was selected as the anterior muscle; and the semispinalis cervicis (SSC), splenius capitis (SC), and multifidus muscles (MM) were selected as the posterior muscles. We calculated LC/SSC, LC/SC, LC/MM, and LC/(SSC + SC + MM), as indicators of neck muscle balance.

Results: The DHS and the CSM cohort comprised 26 and 52 patients, respectively. Both cohorts had a mean age of 71-year-old. There were no significant differences in the CSAs and most of the indicators of neck balance between the two cohorts. However, the LC/SSC was significantly higher in the DHS cohort than that in the CSM cohort (40.3% and 29.1%, respectively; $p < 0.01$) (Table).

Discussions: Results suggested that the anteroposterior balance of the cervical paraspinal muscles differed between the DHS and CSM cohorts. Anteriorly biased antero-posterior balance may make cervical extension difficult. No study has formerly reported on the anterior–posterior balance of the cervical paraspinal muscles, and this study is novel in this respect.

SIGNIFICANCE/CLINICAL RELEVANCE: Our study highlights a unique anterior-posterior imbalance in the CPM of DHS patients, differing from CSM patients. Strengthening the SSC muscle could be a key to preventing DHS progression.

Figures:

Fig.1

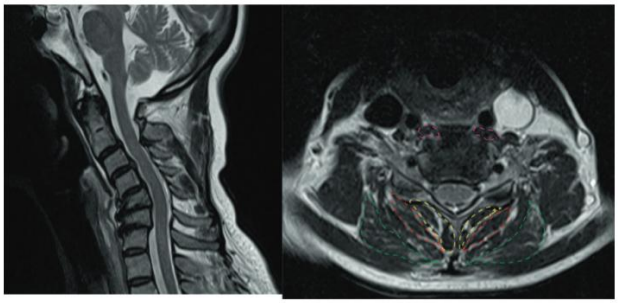

Figure 1. Magnetic resonance images depicting dropped head syndrome. Left and right images reveal the transverse relaxation time (T2)-weighted sagittal, and axial images of the cervical spine (fifth/sixth cervical vertebral [C5/6] disc level), respectively. Magenta, red, green, and yellow, depict the longus colli, semispinalis cervicis, splenius capitis, and multifidus muscles, respectively.

Fig.2

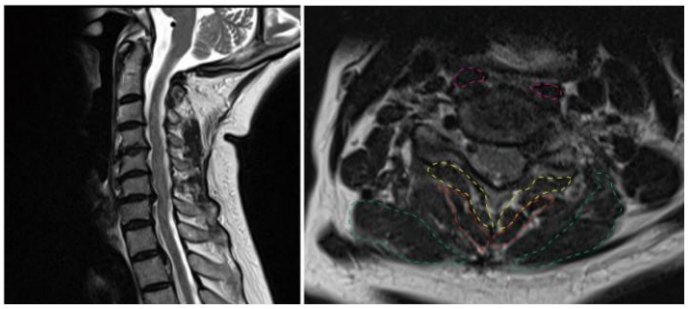

Figure 2. Magnetic resonance images depicting cervical spondylotic myelopathy. Left and right images show the transverse relaxation time(T2)-weighted sagittal, and axial images of the cervical spine (fifth/sixth cervical vertebral [C5/6] disc level), respectively. Magenta, red, green, and yellow, depict the longus colli, semispinalis cervicis, splenius capitis, and multifidus muscles, respectively.

Table

	DHS	CSM	*p*
Multifidus muscle (MM)	0.76 ± 0.35	0.71 ± 0.27	0.44
Semispinalis cervicis (SSC) muscle	0.94 ± 0.43	1.07 ± 0.41	0.17
Splenius capitis (SC) muscle	1.75 ± 0.78	1.51 ± 0.54	0.12
Longus colli (LC) muscle	0.29 ± 0.09	0.28 ± 0.10	0.47
SC+ SSC + MM	3.45 ± 1.26	3.29 ± 0.99	0.55
Goutallier classification	1.42 ± 1.23	1.75 ± 0.92	0.19
LC/(SC + SSC + MM)	10.3 ± 6.0	8.94 ± 3.38	0.21
LC/SC	22.9 ± 17.5	20.1 ± 8.51	0.35
LC/SSC	40.3 ± 25.0	29.1 ± 14.0	0.01*
LC/MM	46.8 ± 25.6	43.9 ± 20.5	0.58

Cross-sectional areas of the cervical paraspinal muscles(means ± standard deviations; cm 2), Goutallier classification and anterior–posterior balance of the cervical paraspinal muscles (means ± standard deviations; %) at theC5/6 level.
CSM, Cervical spondylotic myelopathy; DHS, Dropped head syndrome. LC, Longus colli; MM, Multifidus muscles; SC, Splenius capitis;SSC, Semispinalis cervicis.*p < 0.05