Interpretation of cervical passive accessory intervertebral movements: From thumbs to outcomes

Author
Tuttle, Neil Alan

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registered with ultrasound: a comparison of patients and healthy controls

Anneli Peolsson, Michael Peolsson, Gwendolen Jull, Shaun O’Leary

Department of Medical and Health Sciences, Division of Physiotherapy, Linköping University, Linköping, Sweden; Computational Life Science Cluster and Department of Chemistry, Umeå University, Umeå, Sweden; NHMRC CORE (Spinal Pain, Injury and Health), The University of Queensland, Brisbane, Australia

PURPOSE: To compare the mechanical activity of the ventral and dorsal neck muscles in individuals with persistent longstanding disability after surgery for cervical disc disease to that of healthy controls, during a loaded arm elevation task.

RELEVANCE: There are limited studies investigating the long-term effect on cervical motor function associated with surgery for cervical disc disease.

METHODS: Ten individuals (mean ± SD age, 60 ± 7 years) who underwent anterior cervical decompression and fusion (10–13 years ago) for cervical disc disease and 10 healthy age- and sex-matched controls participated in the study. Ultrasonography and postprocess steppe-track-analysis were used to investigate the degree of deformation (%) and deformation rate (m/s) of ventral and dorsal neck muscles at the C4 segmental level during 1 repetition of loaded arm flexion to 120° (barbell, 2 kg for men and 1 kg for women).

RESULTS: There were significant group effects for ventral muscle deformation and deformation rate (elevated in patients, P<.04), but no group-by-muscle interactions (P>.12). Compared to controls, tests of simple effects revealed that in patients, deformation was significantly elevated for the longus capitis muscle (P<.03) only, and deformation rate for the longus capitis and sternocleidomastoid muscles (P>.04) only. For the dorsal neck muscles, no group (P>.87) or group-by-muscle interactions (P>.33) were observed for either the deformation or deformation rate measures.

CONCLUSIONS: Greater muscle deformation and deformation rates were observed in the ventral neck muscles of patients with longstanding neck disability compared to controls. These differences may be indicative of an altered motor strategy in this patient group when performing the upper-limb task.

IMPLICATIONS: These findings are of potential clinical relevance, particularly for those patients who complain of aggravation of neck symptoms during activities of the upper limb.

INTERPRETATION OF CERVICAL PASSIVE ACCESSORY INTERVERTEBRAL MOVEMENTS: FROM THUMBS TO OUTCOMES

Neil Tuttle

School of Physiotherapy and Exercise Science, Griffith University, Gold Coast, Australia; Musculoskeletal Research Centre, Griffith University, Gold Coast, Australia

PURPOSE: To describe the specific characteristics of passive accessory intervertebral movements (PAIVMs) to the cervical spine that relate to patient symptoms and segmental mobility.

RELEVANCE: PAIVMs are common manual therapy techniques. The interpretation of PAIVM findings is often described using force-displacement curves contained in movement diagrams, but it has not been clear what aspects of the force-displacement curves are related to patient symptoms or to intervertebral mobility.

DESCRIPTION: Contrary to the initial concepts of PAIVMs, the intervertebral movements produced are neither accessory nor localized, but rather physiological and involve the entire cervical region. Nonetheless, specific, measurable characteristics of PAIVMs have been shown to be related to patient outcomes and to local tenderness. This paper will discuss how these specific characteristics compare to simulations using computer-based modeling.

EVALUATION: Experimentally determined changes in PAIVMs at symptomatic locations that occur with symptom improvement are similar to differences between tender and less tender locations. The relevant differences are easier to visualize using stiffness-displacement curves than force-displacement curves that are typically used in movement diagrams and become apparent at levels of force starting at less than those required to click a retractable pen (4–5 N). Computer-based modeling indicates that similar differences in PAIVM stiffness to those found in the clinical studies would be expected to occur with a reduced lax zone of the underlying motion segment.

CONCLUSIONS: The behaviors of PAIVM stiffness related to patient symptoms (1) are more clearly visualized with stiffness curves than force-displacement curves, (2) occur from low levels of force, and (3) are consistent with a smaller lax zone at the underlying intervertebral motion segment.

IMPLICATIONS: The early parts of PAIVM movements contain clinically important information. Simple linear approximations of force-displacement curves of PAIVMs may not be sufficient to detect the specific characteristics that are related to patient symptoms.

A PILOT STUDY COMPARING CERVICAL SPINE STIFFNESS IN PATIENTS WITH CHRONIC NONSPECIFIC NECK PAIN AND ASYMPTOMATIC INDIVIDUALS

Suzanne Snodgrass, Darren Rivett, Lewis Ingram

University of Newcastle, Newcastle, Australia

PURPOSE: To determine if spinal joint stiffness is greater in patients with nonspecific neck pain, and whether the magnitude of stiffness is associated with self-reported pain and disability.

RELEVANCE: Musculoskeletal practitioners commonly evaluate spinal joint stiffness as part of their clinical examination in patients presenting with nonspecific neck pain. However, a relationship between cervical spine stiffness and nonspecific neck pain has not yet been demonstrated.

METHODS: Participants with chronic nonspecific neck pain whose symptom level was identified at C7 were matched with pain-free controls. A cervical spine stiffness assessment device quantified segmental stiffness by applying 5 cycles of standardized mechanical posteroaanterior force to the C7 spinous process while measuring concurrent displacement and resistance to movement. Stiffness was defined as the slope of the linear region of the force–displacement curve and compared between groups using a paired t test. Clinical measures of self-reported pain (visual analog scale) and disability (Neck Disability Index) were obtained from those with neck pain to determine whether the magnitude of stiffness was associated with pain intensity (Spearman rho) or the level of disability (Pearson r).

RESULTS: Participants with neck pain (n = 12) demonstrated greater spi-