

Dysfunction of the Longus Colli and its Relationship to Cervical Pain and Dysfunction: A Clinical Case Presentation

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Abstract: This case presentation discusses a rationale for soft-tissue treatment of the anterior neck muscles (especially the longus colli). The importance of neuromuscular re-education of the neck muscles is also addressed with the use of Proprioceptive Neuromuscular Facilitation (PNF). The patient was a 26-year-old rugby player who presented with a history of two incidents of cervical trauma. His chief complaint was of a "feeling of lack of control" of his neck. A treatment approach using soft tissue mobilization and neuromuscular re-education was utilized. The patient was seen for two visits and was able to return to playing rugby following the first session.

Key Words: Cervical spine, Longus colli, Proprioceptive Neuromuscular Facilitation

Many articles and texts have been written regarding the evaluation and treatment of cervical pain and dysfunction¹⁻⁵. This article presents soft-tissue dysfunction of the anterior cervical muscles (primarily the longus colli) and neuromuscular control as important components to evaluate and treat in all patients presenting with cervical complaints. Neuromuscular function may include stabilization of joints⁶, control of joint movement⁷, and proprioceptive feedback (kinesthesia)⁸.

Physical therapy for cervical dysfunction has included traction², specific joint mobilization¹, soft-tissue mobilization^{9,10}, and various approaches to exercise^{6,7,11}. Revel and associates present a treatment program utilizing the

visual reflexes to decrease cervical pain and dysfunction¹².

Here, a case study will be presented to illuminate an evaluation and treatment approach for managing soft-tissue and neuromuscular dysfunction in the cervical spine. A conceptual framework will also be presented concerning the important roles that the soft tissue and the neuromuscular system play in efficient function^{9,10,12}. The importance of efficient tissue mobility to allow motion and appropriate neuromuscular control for stability and for the initiation of motion (which includes efficient proprioceptive feedback) can be critical components in restoring optimal function^{7,9,13}. The following case study of the treatment of a patient with longus colli soft-tissue and neuromuscular control dysfunctions may explain some less-than-satisfactory outcomes in cervical spine treatment.

The longus colli and the associated anterior neck structures (fig. 1) are not frequently mentioned as aspects of treatment strategies, but in the author's experience, they are often dysfunctional. Pettman describes the lack of ligamentous and muscular restraints for ex-

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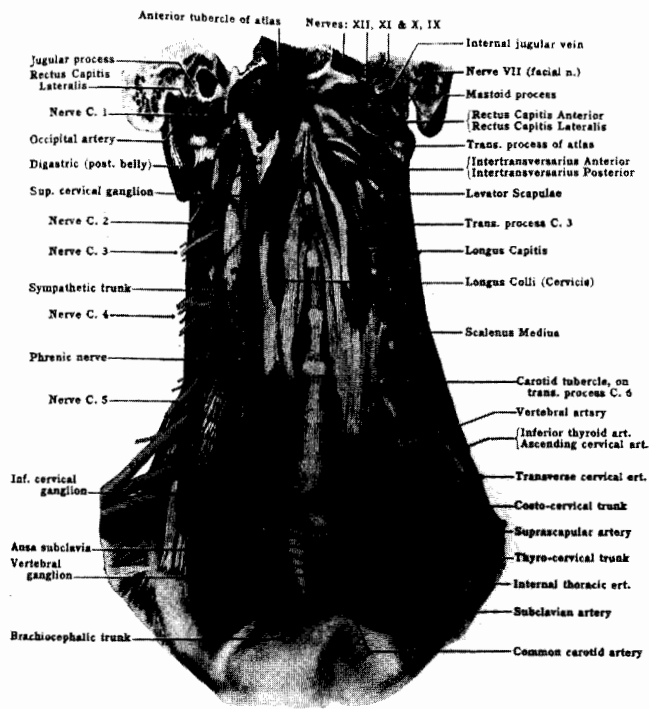


Fig. 1: The anterior neck musculature and related structures. (From Grant's Atlas of Anatomy with kind permission.)

tension as compared to structures that resist flexion so any dysfunction in the anterior neck musculature could have significant consequences for the patient¹⁴. These dysfunctions include decreased play - the ability of the structure to freely move in relation to the other structures surrounding it^{9,10}, increased tone and trigger points, weakness, and poor motor recruitment patterns. When the anterior cervical muscles are properly rehabilitated, they support return to optimal functioning and an asymptomatic state.

Review of Anatomy

The anterior neck muscles (fig. 1) consist of the short neck flexors: the rectus capitis anterior and lateralis; the longus capitis; and the longus colli, which is composed of three parts: the superior oblique, inferior oblique, and the vertical. The anterior, middle and posterior scalenes are also considered anterior neck muscles since they lie anterior to the transverse processes of the cervical vertebrae. The superior oblique portion of the longus colli originates on the transverse processes of vertebrae C3-5 and inserts on the arch of atlas. The inferior oblique portion originates on the bodies of vertebrae T1-3 and inserts onto the transverse processes of C5-6. The vertical portion of the longus colli arises from the bodies of C5-7, T1-3 and inserts into the bodies of C2-

4^{15,16}. The close proximity of the longus colli to both the scaleni muscles and the carotid artery can be seen in Figure 1. The anterior neck musculature is innervated by the ventral primary ramus of the corresponding cervical level.

Functionally, the longus colli is responsible for maintaining anterior stability of the cervical spine as a whole and for each individual movement segment. Basmajian states that "the longus colli is the only spinal muscle that both lies in front of the spinal column and has attachments confined to the vertebrae"¹⁷. Isotonically the longus colli assist the sternocleidomastoids in neck flexion by stabilizing the vertebral column. Without the function of the longus colli, bilateral contraction of the sternocleidomastoids would cause an increase in cervical lordosis. This stabilization of the cervical spine is also important during unilateral contraction of the sternocleidomastoid for rotation¹⁸.

Kapandji states that the longus colli is also a prime mover in the movement of axial extension (dorsal glide) and also indicates that the pull of the scaleni muscles will also cause increased cervical lordosis if the vertebral column is not stabilized by the longus colli¹⁸. Functionally, the longus colli is so positioned that an increase in the cervical lordosis can cause it to lengthen relative to a shortening of the neck extensors (which include the scaleni, levator scapulae, and upper trapezius). This seems to be a common finding in many patients: clinically tight neck extensors and scalenes with corresponding weak neck flexors. In these cases, the longus colli will be in a chronic lengthened state and become inhibited and weakened^{7,8,19}. This may also be a case of phasic and tonic muscle interaction, as previously presented by Janda¹⁹. The Proprioceptive Neuromuscular Facilitation concept of reciprocal inhibition may also be another way to explain this observation²¹.

Frequently, in cases involving trauma (e.g., whiplash) decreased play (accessory mobility) of the longus colli will be identified through soft-tissue evaluation. This decreased play can be a general lack of lateral and/or medial mobility of the whole muscle belly; however, in most cases, the restriction will be specifically identified at or close to the dysfunctional spinal level. This decrease in normal play may be theorized to limit vertebral rotation at that level, since the muscle will not slide over the underlying vertebral (specific anatomic) segment. Dysfunctions of play will also limit flexion and lateral flexion because the muscles will be unable to shorten or fold with motion^{9,10}.

One author has clinically observed weakness of the cervical flexors associated with forward-head posture as contributing factors in patients with cervical headache²². Wyke, in his review of the articular receptors in the cervical spine, presents neurophysiological evidence of the important contribution of the cervical spine to balance and posture⁸.

Case Presentation

The patient was a 26-year-old elite rugby player who presented with complaints of cervical pain and dysfunction. The patient was a well-developed mesomorph who had played linebacker for an NAIA national championship football team in college. He was employed as fitness instructor/coordinator for a large health club. In rugby, he played a front-row position called hooker, which requires that he be positioned between two other front-row players called props. The front rows of both teams engage as noted in the illustration (fig. 2). This position requires that the hooker strike with his foot as the ball is placed into the scrummage between the two front rows by the scrumhalf. The position demands that the athlete



Fig. 2: The scrum as it forms from the two groups of forwards in rugby. The position of the hooker is in the middle of the front row of each team's scrum formation. (Iseham photograph)

be both flexible and strong, especially in the neck.

The history of this athlete's complaint consisted of two separate occasions of trauma. The first injury had occurred approximately three weeks earlier and was reported by the patient as a cervical extension injury with no subsequent neurological complaints. He was able to complete the match and, the following week, to participate in training sessions that included contact without experiencing significant symptoms.

The second injury occurred that next weekend, when he participated in a select-side match against an international touring team. During the match, the scrummages were repeatedly collapsed and he suffered repeated flexion trauma with compression. Once again, he was able to complete the match but afterwards had significant complaints of neck pain. The athlete was sent to the emergency room for precautionary x-rays, which were read as negative.

The athlete came for treatment one week later, complaining of slight cervical pain as noted on the body chart (fig. 3) that was intermittent and rated as 3/10 on a Borg pain scale with moderate limitation of range of motion. His main complaint was a feeling that his neck was somehow unstable when attempting to participate in rugby practice. He was afraid to "stick his head into practice situations." Observation of his posture showed a mild increase in cervical lordosis and thoracic kyphosis. He had well developed neck and upper quarter musculature.

Objective evaluation demonstrated a 25% limitation in right cervical rotation compared to left rotation, and side bending was limited bilaterally secondary to soft-tissue hypertrophy. Quadrant testing as described by Maitland consisting of extension with the addition of sidebending and rotation was painful to the right and limited approximately 25% as compared to the left quadrant¹. Evaluation of the craniocervical ligaments demonstrated no instability or pain. Due to the incidents of trauma to his neck, a full neurological screen was done, including manual muscle tests in all myotomes of the upper quadrant as well as biceps, triceps and brachioradialis reflexes. These were all normal with no weakness noted or difference in reflex response. Sensation was noted to be intact and normal in all dermatomes. During testing of the muscles of the upper quadrant as well as of the neck,

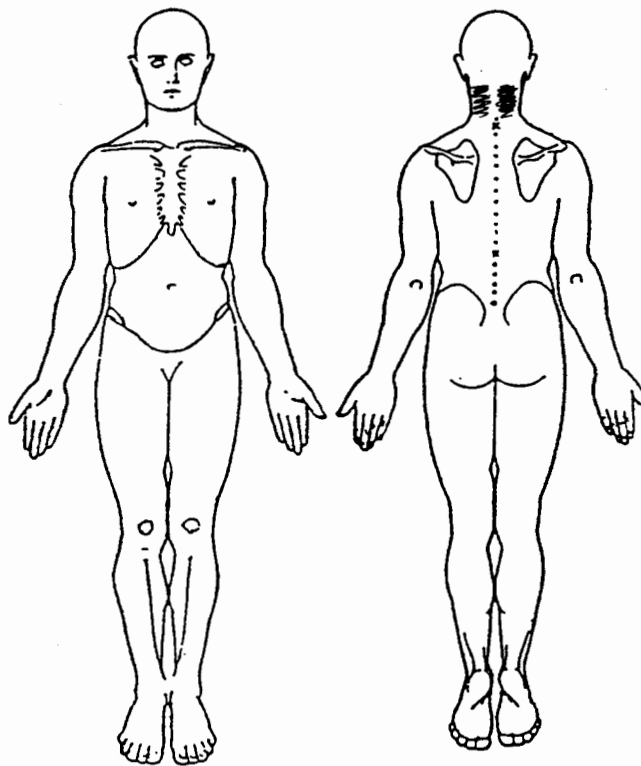


Fig. 3: Body Chart

specifically the upper trapezius, chin tuck, chin protraction, and side bending bilaterally, the patient complained of feeling like he could "not control the movement" but it was not noted to be weak.

The objective evaluation process continued with selective layer palpation of the soft tissues of the head and neck, which demonstrated the following results: mild restrictions in the sternocleidomastoid on the right, and bilaterally in the scalene muscles. The chief finding of the palpation evaluation was that the right longus colli was significantly restricted in normal medial-lateral play and was taut and constricted "like a thin piece of spaghetti" when compared to the left which was fairly mobile, wide, and pliable.

Passive cervical spine accessory intervertebral motion (PAIVM) was undertaken in the prone position as described by Maitland¹. The patient reported minimal discomfort, and motion was noted to be minimally restricted to right unilateral posterior-anterior pressures at the C3-4 level.

The dysfunction of the right longus colli was felt to be the primary myofascial restriction, and treatment was addressed to normalize its play and tone. The treatment consisted of direct pressure to the muscle belly of the longus colli, followed by perpendicular strumming^{9,10}. The muscle was felt to decrease in hardness following the treatment, and its side-to-side mobility had improved. At this point, the athlete was re-evaluated in the sitting position. The difference in cervical range of motion in rotation had disappeared, but he still felt hesitancy in the right quadrant position. He reported that he felt a "lack of control of the movement." The treating therapist felt this was due to poor neuromuscular control and initiated a treatment program utilizing Proprioceptive Neuromuscular Facilitation (PNF) with the use of neck diagonal patterns. The techniques applied initially were hold/relax, then progression into slow reversals, and fi-

nally a combination of isotonic (e.g., concentric and eccentric contractions of the same muscle in sequence)²³. These were done in various positions including supine, prone, quadruped, and sitting. The emphasis of the neuromuscular re-education was on control of movements, especially of the eccentric motion in the diagonal movement patterns.

Following the neuromuscular re-education treatment, the athlete reported that he "no longer felt lack of control of neck movement" and, objectively, the quadrant test was completely negative and equal bilaterally. The athlete was instructed in a home exercise program of general neck stabilization including chin tucks with head lifts to work the deep cervical flexors¹⁹ and neuromuscular re-education exercises consisting of PNF neck diagonals with a partner in the sitting, supine, and quadruped positions²³ in addition to his usual neck workout routine which consisted of the use of a four way neck resistive machine as well as buddy isometric neck exercises at rugby practice.

At a subsequent appointment, the patient reported that he had been able to play the following weekend without experiencing any of his presenting symptoms. At this time, further adjustments to his home exercises were made to emphasize proper sequencing and motor patterning, and he was discharged from physical therapy.

Discussion

This case study presents a rationale for treatment of the anterior neck musculature, especially the longus colli, followed by neuromuscular re-education which the author believes is often overlooked in the care of the cervical patient. The longus colli and its' neurophysiological function may be critical in helping to determine a positive outcome in a physical therapy program for cervical dysfunction thereby reducing cervical pain. ■

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