CLINICAL NOTES

Systemic Malignancy Presenting as Neck and Shoulder Pain

William C. Welch, MD, Richard Erhard, DC, PT, Brent Clyde, MD, George B. Jacobs, MD

- Systemic malignancy can be manifested by musculoskeletal complaints. We review the history, physical examination, and diagnostic imaging studies of a patient whose chief complaints were neck and shoulder pain. This patient also had significant weight loss and a history of tobacco abuse. Aggressive physical therapy and appropriate medications failed to provide symptomatic relief of neck and shoulder pain. Further studies revealed lung cancer. Systemic malignancy can cause referred musculoskeletal pain without obvious metastatic involvement at the symptomatic area, and should be considered in patients with persistent symptoms.

© 1994 by the American Congress of Rehabilitation Medicine and the American Academy of Physical Medicine and Rehabilitation

Systemic malignancy can be manifested by musculoskeletal complaints. We review the history, physical examination, and diagnostic imaging studies of a patient who presented to our spine center with the chief complaint of neck and shoulder pain. The patient had magnetic resonance imaging (MRI) evidence of an upper cervical disc rupture and cervical spondylosis. He received extensive outpatient musculoskeletal evaluations and treatments, but was not afforded symptomatic relief. Ultimately, the patient was proven to have lung cancer. We present this case to illustrate to rehabilitation professionals that systemic malignancy can cause referred musculoskeletal pain and should be considered in patients with persistent symptoms.

HISTORY, PHYSICAL EXAMINATION, AND RADIOGRAPHIC STUDIES

A 54-year-old man presented to our spine center for a second opinion regarding neck pain. The neck pain began 3 months prior to evaluation and was intermittent, predominantly on the right side, radiating into his shoulder, but not into his arm or hand. Coughing and sneezing did not exacerbate his symptoms. The patient was receiving treatment for a possible rotator cuff tear of his right shoulder, despite a normal shoulder MRI. A cervical MRI scan had been performed (fig 1). This revealed a C4-5 herniated intervertebral disc and cervical spondylosis. There was no history of Lhermitte's sign, progressive muscular weakness or sensory loss, balance disturbances, or difficulty with ambulation, bowel, or bladder dysfunction. The patient had a 50 pack/year smoking history and a recent, unexplained weight loss of 6.75kg.

Physical examination revealed a man who appeared ill and was alert and responsive. Neurologic examination identified decreased concentration and diffuse muscular weakness. The right deltoid and biceps muscles had give-way weakness from shoulder pain. Muscular bulk and tone were decreased in the shoulder musculature. Sensory testing demonstrated mild hypesthesia to pin prick in the left S1 nerve root distribution. Cerebellar functions were normal and Romberg's test was negative. Mild hyponreflexia was present in the upper extremities. No pathologic reflexes were elicited.
Fig 2—Antero-posterior chest radiograph reveals a 4cm mass lesion in the right upper lobe of the lung with collapse of the basal segments of the lung and elevation of the diaphragm.

The documented cervical disc rupture and cervical spondylosis were believed to have contributed to the patient's neck pain. The C7-8 level could account for the lack of radicular signs and symptoms. In light of the significant smoking history, weight loss, and persistent symptoms, a metastatic work-up was recommended.

The patient's neck and shoulder pain worsened over the next 12 days and the patient required hospitalization. Decreased breath sounds in the right mid-lung field were noted. The abdominal examination was unremarkable. Neurologic examination demonstrated confusion, early dementia, and mild right hemiparesis. A metastatic work-up was begun with anteroposterior and lateral chest radiographs. A 4cm mass lesion in the right upper lobe of the lung with collapse

Fig 3—Chest CT scan demonstrating mediastinal lymphadenopathy and tumor mass.
of the basal segments and elevation of the diaphragm was noted (fig 2). Mediastinal lymphadenopathy and tumor extension to the right lateral chest wall was found on chest computed tomography (fig 3). Cerebral MRI scanning revealed three large metastatic lesions in the right temporal and occipital lobes and the left thalamus. Endobronchial lung biopsy was consistent with poorly differentiated adenocarcinoma. All cultures were negative for mycobacterium. A technetium bone scan demonstrated equivocal uptake in the right shoulder. Whole-brain radiotherapy was instituted.

As the patient’s course progressed, the right triceps, deltoid, and biceps atrophy became more marked. Sensory loss was noted in the right C2 dermatome, and the right biceps, triceps, brachioradialis, and pectoral reflexes were diminished. MRI scan of the right brachial plexus was normal and the patient refused electromyography (EMG) testing. A diagnosis of polyradiculopathy was made. The cause of the neck and shoulder pain was believed to be multifactorial and related to the cervical disc rupture and spondylosis, polyradiculopathy, tumor invasion of the chest wall, and possible referred pain from phrenic nerve irritation.

**DISCUSSION**

Neck and shoulder pain are usually the result of traumatic or degenerative changes including cervical disc rupture, ligamentous instability, facet degeneration or overgrowth, foraminal narrowing, or bony injury. Diagnostic imaging includes plain radiographs, computerized axial tomography, and MRI scanning. Electromyography also can provide diagnostic evidence of nerve root injury when present.

Inflammatory conditions, infections, vascular lesions, or benign or malignant tumors also can cause local pain and radicular symptoms. The most common benign tumors are extramedullary (ie, schwannoma or neurofibroma). Malignant tumors can be intramedullary (ie, astrocytomas) or extramedullary (ie, metastases). The extramedullary tumors can cause pain from dura or nerve root irritation or direct destruction of bone. In the latter case, bone scans may be of value. Treatment in these cases will be directed at reducing mass effect through surgery, radiation therapy, and chemotherapy. Surgical spine stabilization also may be required if the supporting elements are significantly involved.

Systemic malignancy can cause localized pain and radicular symptoms through local invasion of soft-tissues or bony elements. Pancoast tumors behave in this fashion. These apical lung malignancies are usually squamous cell in origin and can invade or compress the sympathetic chain with resultant Horner's syndrome (ipsilateral ptosis, miyosis, and anhydrosis). Although the shoulder pain and neck pain suggested irritation of the apical lung pleura, this patient did not have a Horner's syndrome.

Polyradiculopathy or polynuropathy are defined by distal weakness, sensory loss, and atrophy. This condition occurs in 2% to 5% of patients with neoplastic disease, the most common type is lung cancer. This syndrome usually implies a poor prognosis.

Referred shoulder pain can be caused by irritation of the diaphragm via the phrenic nerve and the second, third, and fourth nerve roots. Mechanoreceptors have been found in the hepatic vein, hepatic parenchyma, diaphragm, and inferior vena cava, which send afferent nerve impulses through the phrenic nerve and the upper brachial plexus. Direct involvement of the phrenic nerve by mediastinal tumors has been noted in some patients. In a recent study on monkeys, stimulation of the phrenic afferent fibers resulted in an excitatory effect on the C1-C6 spinothalamic neurons with somatic sensory fields predominantly confined to the proximal upper extremity and shoulder. The spinothalamic tract is known to carry noxious afferent stimuli to the thalamus. Relay of these stimuli to the cortex may explain the physiologic mechanism of referred proximal upper extremity pain from the thoracic cavity.

The persistent symptoms in this patient combined with the history of weight loss and tobacco abuse were a cause for concern. A more timely and accurate diagnosis might have been established with a thorough review of the patient's history and a complete physical examination. Because systemic malignancy can cause musculoskeletal or referred pain, we suggest that a broader range of diagnoses be explored in patients with musculoskeletal complaints who do not respond to standard therapies.

**References**