



# An Evidence-Based Approach to Differentiating the Cause of Shoulder and Cervical Spine Pain

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## ABSTRACT

Differentiating the cause of pain and dysfunction due to cervical spine and shoulder pathology presents a difficult clinical challenge in many patients. Furthermore, the anatomic region reported to be painful may mislead the practitioner. Successfully treating these patients requires a careful and complete history and physical examination with appropriate provocative maneuvers. An evidence-based selection of clinical testing also is essential and should be tailored to the most likely underlying cause. When advanced imaging does not reveal a conclusive source of pathology, electromyography and selective injections have been shown to be useful adjuncts, although the sensitivity, specificity, and risk–reward ratio of each test must be considered. This review provides an evidence-based review of common causes of shoulder and neck pain and guidelines for assistance in determining the pain generator in ambiguous cases.

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**KEYWORDS:** Cervical spine; Differentiate; Dysfunction; Pain; Shoulder

Determining the cause of symptoms in patients experiencing a combination of neck and shoulder pain and dysfunction often presents a diagnostic challenge. It is reported that painful shoulder impingement may occur in up to 24% of patients with cervical radiculopathy.<sup>1</sup> Concordance studies have shown that approximately 1 in 10 patients referred for cervical radiculopathy have comorbid shoulder pathology.<sup>2</sup> In addition, pain reported in the neck may represent referred pain from the shoulder girdle and vice versa, because selective injections into the cervical facet joints have been found to manifest as shoulder pain.<sup>3,4</sup>

Although challenging, determining the true source of pain and dysfunction in patients with cervical and shoulder syndromes is essential to providing appropriate treatment recommendations. The success of these treatments is highly dependent on an accurate diagnosis, which can be achieved with careful examination and selective diagnostic testing. This review describes both common and uncommon sources of shoulder and cervical pain and provides an evidence-based, systematic guide to evaluation and diagnosis.

## RELEVANT ANATOMY

The shoulder represents a complex structure consisting of bony, muscular, and ligamentous structures.<sup>5</sup> It consists of a number of joints including the acromioclavicular, glenohumeral, sternoclavicular, and scapulothoracic joints. The shoulder is highly dependent on additional static and dynamic stabilizers.<sup>5</sup> The static stabilizers of the shoulder include the bony architecture, the capsuloligamentous complex, and the glenoid labrum, whereas the rotator cuff muscles provide the primary dynamic stabilization (Table 1).

The cervical spine is made up of 7 vertebrae and 8 sets of nerve roots, which innervate the upper extremity via the

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brachial plexus (Table 2). Although the C1 and C2 vertebrae are uniquely connected by a complex ligamentous complex consisting of the alar and cruciate ligaments, the remainder of the subaxial spine connects through a series of facet joints and intervertebral disks.<sup>6</sup> Pain generated within the spine occurs when the structural elements of the spine compress the nervous anatomy, as seen with a herniated nucleus pulposus or a facet joint cyst.

**PRESENTATION AND HISTORY**

Patient evaluation should begin with a thorough history and physical examination.<sup>7</sup> Subsequent diagnostic testing should be directed by the examination findings, particularly for patients with an unclear presentation or a history of both neck and shoulder pathology.

**Shoulder**

Obtaining a complete shoulder history begins with patient demographics, including age, gender, presence of comorbid medical and psychosocial conditions, hand dominance, and mechanism of injury or onset.<sup>8</sup> The clinician should be aware of certain predispositions to shoulder pathology, such as the association of diabetes mellitus and hypothyroidism with adhesive capsulitis.<sup>8</sup>

A complete characterization of the pain, including quality, progression, and aggravating and relieving factors, is determined from the history. For example, dull and aching pain is more consistent with shoulder pathology, whereas burning or electric type pain is more indicative of cervical spine or neurologic origin.<sup>7</sup> Painful arm abduction is consistent with shoulder pathology, whereas arm abduction may relieve symptoms in patients with cervical radiculopathy.<sup>9</sup> The progression of the pain also is of diagnostic value because certain symptom patterns can accompany shoulder pathology, such as the stages that commonly occur in adhesive capsulitis: pain (freezing), stiffness (frozen), and recovery (thawing).<sup>10</sup>

**Table 1** Muscles of the Shoulder Girdle

	Innervation	Action
Subscapularis	Subscapular nerves	Internally rotate humerus
Supraspinatus	Suprascapular nerve	Abduct humerus
Infraspinatus	Suprascapular nerve	Externally rotate humerus
Teres minor	Axillary nerve	Externally rotate humerus
Serratus anterior	Long thoracic nerve	Scapular protraction
Trapezius	Cranial nerve XI	Scapular rotation/elevation
Rhomboids	Dorsal scapular nerve	Scapular retraction

**CLINICAL SIGNIFICANCE**

- Differentiating the true cause of shoulder and cervical pain may represent a difficult clinical challenge, with approximately one fourth of patients experiencing both problems.
- Successfully treating these patients requires an evidence-based and systematic approach to the history and physical examination.
- Follow-up imaging should be selected on the basis of the history and physical examination to prevent false-positives.

The anatomic region reported to be painful may mislead the practitioner; however, certain characteristic distributions of pain may be helpful in diagnosing shoulder pathology. Pain directly over the lateral deltoid region suggests subacromial or intrinsic glenohumeral pathology. Pain localized directly over the acromioclavicular joint or directly over the anterior aspect of proximal arm with radiation to the biceps muscle may indicate acromioclavicular joint pathology and biceps tendinopathy, respectively (Figure 1).<sup>3,7</sup> In addition to these characteristic pain distributions, nighttime aching and sleep disturbance are extremely common in shoulder pathology, with up to 90% of patients with rotator cuff tears showing sleep disturbance.<sup>11,12</sup>

Finally, shoulder weakness in the absence of pain should raise concern for nerve impingement.<sup>13</sup> For example, suprascapular nerve entrapment may cause weakness and eventual atrophy of the supraspinatus or infraspinatus muscles, and may result from direct trauma to the shoulder or from a ganglion cyst, as is commonly observed with comorbid labral pathology.<sup>13</sup>

**Cervical Spine**

Cervical radiculopathy commonly produces pain around the lateral portion of the shoulder girdle. Classically, patients with cervical radiculopathy report a combination of strength and sensory disturbances starting in the neck and radiating to the upper extremity, although the presentation may differ on the basis of myotome and dermatome variation (Figure 2).<sup>14</sup> More than 90% of patients with cervical radiculopathy present with arm pain, and thus symptoms of arm pain (especially atraumatic) should trigger an evaluation of the cervical spine.<sup>14</sup>

Certain pathognomonic findings are highly indicative of cervical pathology. The shoulder abduction sign, in which the patient raises his or her arm above the head to relieve pain via reducing tension on a cervical nerve root, indicates

**Table 2** Motor, Reflex, and Sensory Abnormalities Associated with Specific Cervical Radiculopathies

	Motor	Sensory	Reflex
C5	Deltoid Supraspinatus Infraspinatus	Over deltoid	Biceps
C6	Biceps	Radial forearm	Brachioradialis
C7	Triceps	Third digit	Triceps
C8	Finger flexion	Fifth digit	None
T1	Finger abduction	Ulnar forearm	None

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