

# Shoulder Pain, Cervical Spondylosis And Acupuncture

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**Abstract:** In cervical spondylosis there is a progressive degeneration of the intervertebral discs leading to changes in the surrounding structures producing symptoms only when and if these changes intrude upon pain-sensitive structures, the nerve root(s) or the cervical cord. Spondylotic pain may be felt locally or transmitted via the spinal nerve to the corresponding myotome, dermatome and sclerotome. When there is obvious "radiculitis," the referred pain is easily recognized, but when cervical neuropathy is mild, the referred pain may be vague and clinical signs sparse. The clinical picture is particularly perplexing when the pain is referred to the shoulder. Under these circumstances, palpation for tenderness is a useful guide to diagnosis. In intrinsic shoulder lesions, there is usually localized tenderness over the site of pathology whereas in cervical neuropathy the tenderness is present in muscles of affected myotomes maximum at motor points (Type I acupuncture points). Treatment is determined by the underlying pathology which is primarily in the neck and accurate diagnosis is imperative. Rarely when there is progressive deteriorating motor and sensory signs or myelopathy, surgery may be necessary, but in the majority of cases of spondylotic pain, conservative treatment is effective. In the subacute or chronic stages, acupuncture needling with or without electrical stimulation into the tender muscle zones of innervation is extremely effective and transcutaneous neural stimulation less so. The choice and identification of motor points for treatment is simplified by

referral to the neuroanatomy of the cervical spine. The advantages of using neuroanatomic descriptions of acupuncture points are discussed. Patients who fail to improve with acupuncture probably have persistent structural changes in the cervical spine or possibly myelopathy.

CERVICAL SPONDYLOSIS is a condition in which there is a progressive degeneration of the intervertebral discs leading to changes in the surrounding structures, especially the bones and meninges. In the past this condition has been called osteoarthritis, cervical spondylitis, cervical syndrome, herniated disc, chondroma, etc., but the term "spondylosis" is considered preferable as the condition is degenerative, rather than an inflammatory, or neoplastic one.<sup>1</sup> Spondylosis, per se, as part of the aging process, produces no symptoms as it is with us all and "by the eighth decade almost universal".<sup>2</sup> Symptoms only occur when and if the degenerative changes in the vertebral discs, or secondary changes in the adjacent vertebrae intrude upon and affect pain-sensitive structures and nerve roots(s) or the cervical cord. Pressure may occur at one or more levels causing simultaneous damage to both roots and cord and paraplegia may occur.<sup>3</sup> Rheumatoid arthritis, ankylosing spondylitis and Paget's disease are sometimes complicating factors.

Spondylotic pain has no single explanation and may originate from the synovial spinal joints, the intervertebrate discs or the bone of

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the vertebrae. Whatever the actual pathogenesis may be, and many mechanisms have been proposed<sup>4</sup> — compression by degenerative intervertebral disc material of extradural chondromas, interference with the blood supply, tethering by ligamenta denticulata, hypertrophy of the ligamentum flavum, excessive movement between adjacent vertebrae, or constitutional stenosis of the spinal canal — an early result is pain which may be felt locally or transmitted via the spinal nerve to the corresponding myotome, dermatome or sclerotome.<sup>5</sup> Since these areas of reference do not correspond with one another<sup>6</sup> (Fig. 1), the resulting multiphasic clinical picture often causes confusion. Referred pain in the dermatome is felt as paresthesia and described by the patient as “numbness,” “deadness” or “tingling,” in the sclerotome as a nagging, deep pain described as “dull” or “boring,” and in the myotome as muscle pain and tenderness.

### Local Pain

Local pain occurs at pain-sensitive tissue sites and structures<sup>7</sup> as a result of irritation, injury, inflammation or infection (Fig. 2):

#### Pain-Sensitive Tissues

Posterior longitudinal ligament  
Anterior longitudinal ligament  
Interspinous ligament  
Facet articulation  
Facet capsule  
Nerve root  
Muscle

#### Pain-Insensitive Tissues

Cervical disc  
Annulus (?)  
Ligamentum flavum  
Vertebral body

The nerve root in its course through the intervertebral foramen has sensitive fibers at (a) the nerve fibers of the dural sheath of the nerve root, (b) involvement of the dorsal sensory root and (c) the sensory fibers of the motor root. The mechanism of pain is probably from ischemia secondary to stretch: “Pain is the cry of a nerve deprived of its blood supply” (Sir Henry Head).

### Referred Pain

Referred spondylotic pain (usually into the shoulder and arm) is easily diagnosed when there is obvious “radiculitis”—a clinical term commonly used to describe the discomfort or pain radiating along the peripheral nerve. When radiculitis is present, the referred pain is sharp and well localized with paresthesia and numbness and “tingling” in the sensory distribution of the root. There may be muscle fasciculation, cramp or weakness in the motor distribution and tendon reflexes may be depressed. However, when cervical neuropathy is mild, the referred pain may be vague and clinical signs sparse. The perplexing clinical picture may then lead the examiner to dignify the pain with a variety of terminological labels devoid of physiological significance. Treatment then based on unfounded pathomechanical concepts is bound to fail.<sup>8</sup>

Cervical spondylotic pain may be referred to the shoulder, arm, hand, dorsal back, over the scapulae and anterior chest and may be confused with intrinsic shoulder pain, tennis elbow,<sup>9</sup> or even mimic angina pectoris or myocardial infarct.<sup>10</sup> It is essential, therefore, for the examiner to constantly keep in mind the respective dermatomes, myotomes and sclerotomes supplied by the cervical nerve roots.

Pain in the shoulder region is particularly confusing because it may be due to local shoulder lesions, referred from the neck or from viscera. Indeed, pain in the shoulder may be the only presenting symptom of cervical disc degeneration since the presenting symptom of neck lesions is seldom in the neck, but commonly in the shoulder region. The commonest causes of shoulder pain are cervical spondylosis (referred) and rotator cuff tendinitis (local):<sup>4</sup>

#### Shoulder Pain: Local Causes.

1. Neoplasm of shoulder girdle.
2. Osteomyelitis.
3. Avascular necrosis of head of humerus.
4. Arthritis of glenohumoral joint:
  - rheumatoid.
  - metabolic.
  - infective.

Arthritis of acromioclavicular joint:  
degenerative.

5. "Shoulder girdle neuritis" due to:  
neuralgic amyotrophy.  
serratus anterior palsy.  
supraspinal nerve entrapment.
6. *Rotator cuff tendinitis*.

#### Shoulder Pain: Referred Pain.

1. Thalamic pain.
2. Thoracic outlet syndromes.
3. Apical lung tumors.
4. Mediastinal lesions.
5. Diaphragmatic irritation.
6. *Cervical spondylosis* (with and without root irritation).

Whether pain in the shoulder (and arm) results from a local lesion, or is referred there can be determined only by clinical examination. The diagnosis of intrinsic shoulder pain is outside the scope of this paper but there are many good descriptions for the examination of the shoulder for local lesions and the reader is referred to them.<sup>5/8/11</sup> Generally, the patient suffering from shoulder lesions demonstrates the site of pain by placing his hand over the deltoid,<sup>11</sup> whereas in referred pain the patient complains of a vague and nagging persistent pain outlined in a broad and diffuse manner over the area between neck and shoulder. Pain from the neck is sometimes, though not always, reproduced or modified on movement of the cervical spine, whereas shoulder pain from intrinsic causes is almost always reproduced on movement of the shoulder.

#### Palpation for Tenderness as a Guide to Diagnosis

Palpation for tenderness is, in our experience, a useful guide to diagnosis. In *intrinsic shoulder lesions*, localized tenderness over the various components of the shoulder may reveal the site of pathology (Fig. 3). Some salient features of a few common intrinsic shoulder lesions are briefly summarized in Table II.

In *early spondylotic referred pain*, apart from subjective discomfort, there are usually no significant physical signs. The neuro-

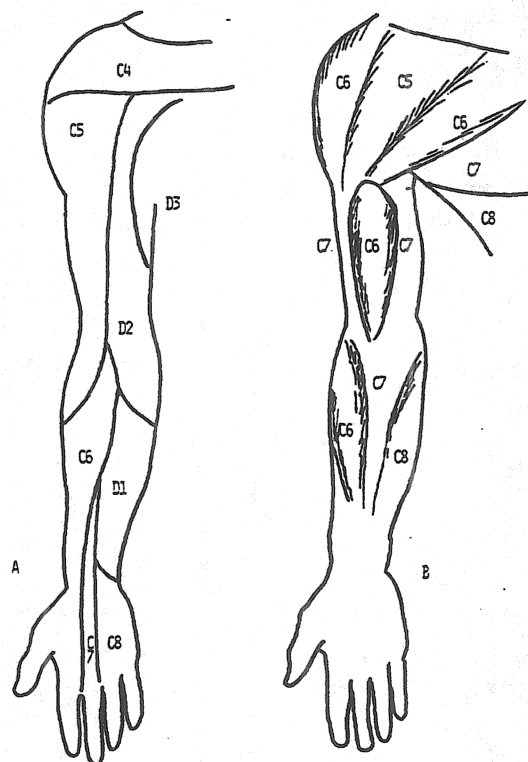
logical examination is essentially negative. An electromyographic examination including nerve conduction studies to exclude peripheral causes, e.g., carpal tunnel syndrome then is the most sensitive, if not the only means of reliable diagnosis, but since this is not always generally available, tenderness at motor points is an effective alternative.

Cervical neuropathy is reflected in sensory, motor and autonomic signs. Superficial *sensory* changes may occur in affected dermatomes, but because of dermatomal overlapping, may be difficult to accurately delineate. In early neuropathy, perceptible atrophy may be present. (Commonly the supraspinal tus and infraspinatus show slight flattening and the biceps is flabby). Fasciculation is rare. Tendon reflexes only become depressed in later stages. *Autonomic* instability, when present, may be apparent immediately as the patient undresses — cool air falling on exposed skin may produce a pilomotor effect or cutis anserina ("goose pimples") in affected dermatomes. This sign may be reinforced by pressure over any tender motor point. Vasomotor manifestations such as poor circulation may sometimes be observed — the pain site after exposure to cool air for a few minutes may be slightly colder to touch.

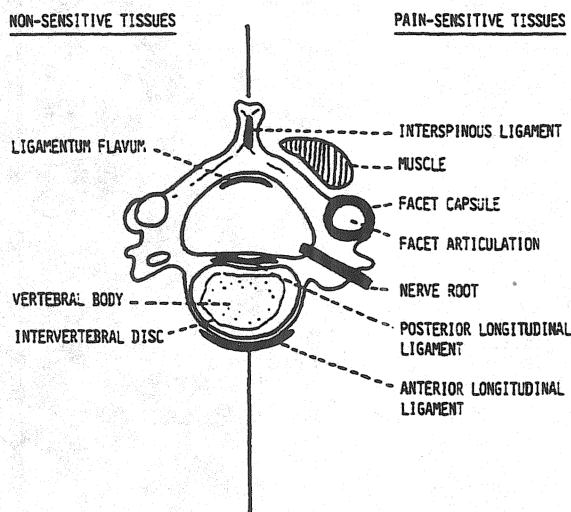
We have previously described tenderness present in muscles of affected myotomes maximum at motor points.<sup>12/13</sup> Since a motor point—the skin area over the site where the nerve enters the muscle and corresponding to the motor band or zone of innervation<sup>14</sup>—is a fixed anatomic site, once learned, it is easily found (Figs. 4, 5). These tender "myalgic points" correspond to Type I acupuncture points.<sup>15</sup> In cervical spondylosis, at any affected segmental level, there should be tenderness present at (a) locally over pain-sensitive periarticular tissues of the apophysal joints, (b) in the posterior cervical muscles supplied by the posterior primary ramus, and (c) in most muscles of the myotome at their motor points. If tenderness is found in muscles of both anterior and posterior primary rami, then the pathology is logically at root level. (The rationale for this procedure is similar to that used in electromyography).

**TABLE I.**  
Spinal Cord Root Derivations of Motor Nerves  
Supplying Some Arm and Shoulder Muscles.

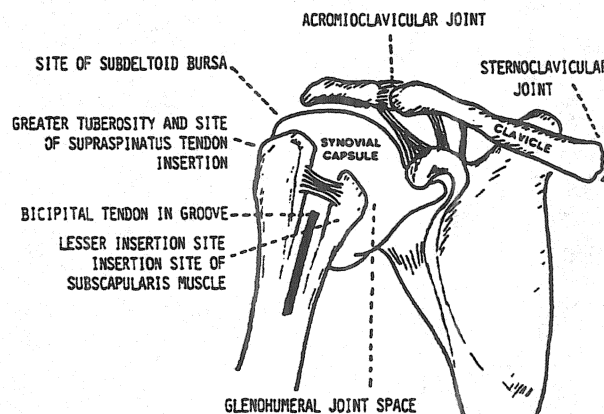
Muscle	Root Innervation	Peripheral Nerve
Trapezius (upper)	C3-4	Spinal accessory
Supraspinatus	C5-6	Supracap.
Infraspinatus	C5	Supracap.
Deltoid	C5-7	Axillary
Biceps brachii	C5-6	Musculo-cutaneous
Ext. carpi Radialis	C5-6-7	Radial
Ext. carpi ulnaris	C6-7-8	Radial
Ext. dig. communis	C6-7-8	Radial
Triceps brach.	C6-7-8	Radial
Flex. carpi ulnaris	C7-8, D1	Ulnar
Add. poll. brevis	C8, D1	Ulnar



**FIG. 1.**  
Diagram to show that dermatomes (A) do not correspond to underlying myotomes (B).



**FIG. 2.**  
Showing tissue sites of pain production around vertebra.



**FIG. 3.**  
Diagram showing palpable tender points of some intrinsic shoulder lesions.

Cervical spinal range of motion may appear full, but when carefully assessed may show slight limitation of lateral bending and rotation towards the affected side. To sensitive fingers, the loss of motion at the affected apophyseal joints may be palpably discerned.

### Treatment

#### (a) *Conservative:*

Treatment for cervical spondylotic pain is determined by the underlying pathology which is primarily in the neck. Accurate diagnosis is imperative to exclude shoulder lesions or pain referred from elsewhere. Treatment should never be instituted without a good examination.

Rarely when a nerve root is under constant pressure by structural changes, e.g., a prolapsed intervertebral disc (acute, following trauma and usually at one level) and the nerve damage has led to denervation (as demonstrated by electromyography), then there may be no alternative to surgery.<sup>18</sup> Again, when there is severe osteophytic encroachment into the intervertebral foramina (chronic and usually at more than one level), surgery may not be considered feasible; one may have to be prepared to hope for eventual resolution of pain by pain fibers degenerating into axonotmesis.

In all other cases of spondylotic pain, conservative treatment should be directed both to the primary factor in the cervical spine and to secondary pain within the segmental distribution. For the cervical spine, at the acute stage, anti-inflammatory drugs and rest for a strictly limited period in a cervical collar are indicated. Once past the acute stage, gentle mobilization or manipulation or traction in flexion, with or without ultrasound to sensitive apophyseal joints may be instituted. Later, isometric exercises are added as tolerated.

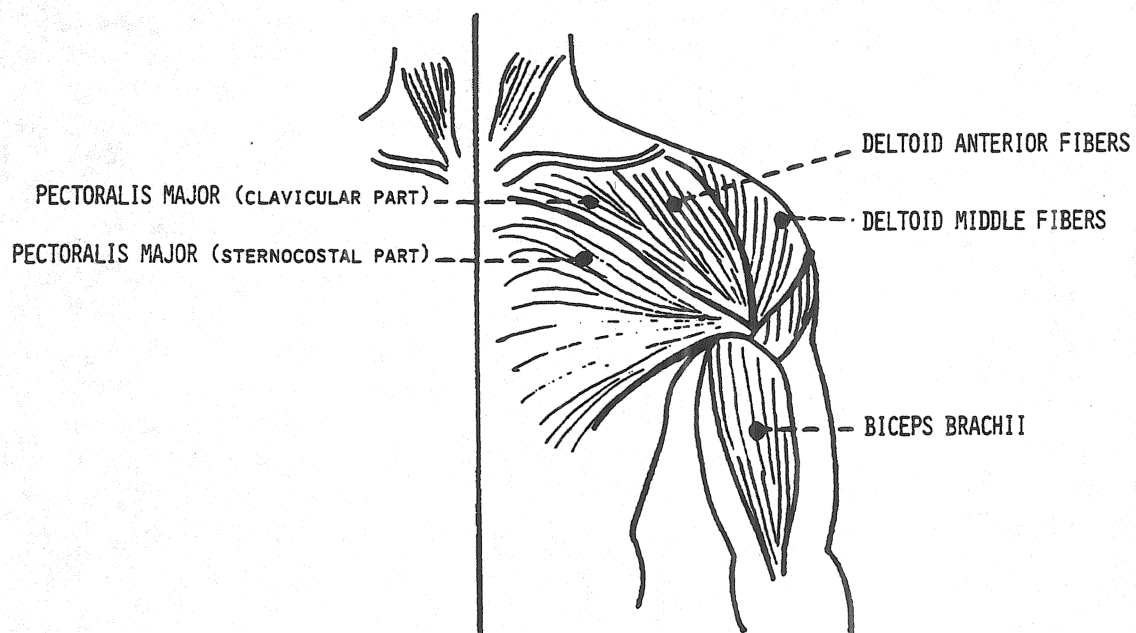
For referred pain, standard measures such as ultrasound, heat, short wave diathermy, massage, etc., are the usual standbys. In the subacute or chronic stages, acupuncture needling with or without electrical stimulation into the tender muscle zones of innervation is extremely effective. Transcutaneous

neural stimulation is also effective, but in our experience less so than needling. Production of the Teh Ch'i phenomenon is important.<sup>16</sup> We prefer actual needling of the points for we believe the microtrauma produced and the subsequent replacement of nociceptors by fibrous tissue yields results that are usually more permanent. At the motor zone of innervation are concentrated the afferent fibers of proprioceptors, nociceptors and muscle spindles. Destruction of the latter would lead to a general tonic descending influence on the gamma loop since excess afferent barrages from the primary endings or annulospiral endings wound around the intrafusal fibers are excitatory and responsible for reflex muscle spasm. These afferent fibers (Ia) are also large in diameter (15 microns) and are those particularly sought for stimulation to produce analgesia according to the Gate Theory.

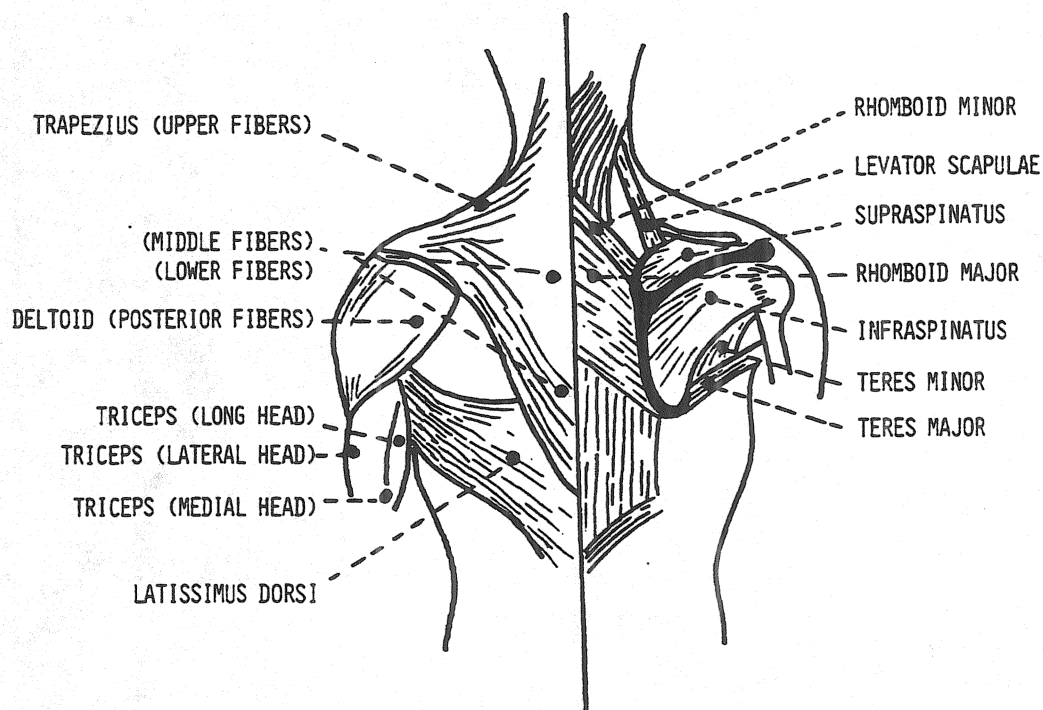
The choice and identification of motor points (Type I acupuncture points) for treatment are simplified by referral to the neuroanatomy of the cervical spine (Figs. 4 and 5). Both anterior and posterior rami-supplied muscles should be treated, paying most attention to the tender ones. When a treatment site is specified in neuroanatomical terms, its exact identity as an anatomic entity is known, including its nature, depth, size, and relationship to other structures and neurological connections. The exact defined entity is also quickly explained and communicated to others trained in anatomy, incidentally making acupuncture more creditable to the medical profession in general.

Neurometer readings are higher (or resistance to D.C. is lower) at skin over motor points, but with a little practice motor zones of innervation or trigger points<sup>13</sup> which may be nodular are palpable to sensitive fingers. Affected ones are usually tender. (Tenderness is, after all, merely pain induced by pressure). It helps to remember that a motor band or zone is in muscle and its depth varies accordingly to that particular muscle and thickness of overlying subcutaneous tissues. An experienced acupuncturist, therefore, has little call upon his neurometer. The labeling of





**FIG. 4.**  
Some motor points on the anterior aspect of the shoulder.



**FIG. 5.**  
Some motor points on the posterior aspect of the shoulder.

**TABLE II.**  
**Brief Descriptions of Some Common Intrinsic**  
**Shoulder Lesions.**

### 1. Rotator Cuff Injuries.

Damage to the rotator cuff varies from the tear of a few fibers in the substance of the tendon to tears involving the full thickness of the cuff. Predisposing factors are the degenerative changes ("degenerative periarthritis") occurring with age in the shoulder joint. Many patients will present with the sequelae of attrition in both cuff and biceps tendon.

A. In "tendinitis" there is passive movement with pain at the extremes but usually there is pain and weakness on resisted movements; resisted abduction — supraspinatus muscle; resisted lateral rotation — infraspinatus; resisted rotation and adduction — teres minor or resisted medial rotation — subscapularis. Resisted adduction seldom hurt. A painful arc indicated tender tissue between the tuberosities and the acromion. Following trauma in degenerative periarthritis, there may also be limitations of shoulder joint motion in a capsular pattern, a little limitation of medial rotation, some limitation of abduction and most limitation occurring in lateral rotation. Night pain is also a common feature.

B. In complete ruptures there is severe pain with inability to abduct the arm. These patients are usually over 50 years. Roentgenograms are negative for fractures or dislocations. Surgical repairs are usually necessary.

### 2. Bursitis (Subdeltoid).

Bursitis is seldom a primary condition, being usually secondary to degenerative lesions of the cuff. Examination in these patients will show either a painful arc alone (indicating that a tissue lying between one of the tuberosities and the acromion is tender) or a painful arc with discomfort at the extremes of passive range but without pain on resisted movements.

### 3. Adhesive Capsules or "Frozen Shoulder."

This syndrome, a clinical and not a pathological entity refers to the stiff shoulder in which active and passive movement is restricted and painful at the glenohumeral joint as well as at the scapulothoracic joint. It is without demonstrable intrinsic cause, has no osseous ankylosis and usually has a self-limited duration.

### 4. Bicipital Syndromes.

The clinical lesions involving the long head of the biceps are:

- A. Tendinitis and tenosynovitis.
- B. Ruptures — partial or complete.
- C. Recurrent subluxation/dislocation.
- D. Elongation.

### 5. Acromioclavicular Joint.

Included in this group are minor sprains, traumatic arthritis (with or without degeneration), subluxations and dislocations. Localized tenderness is nearly always present with pain accentuated by adduction of arm across the chest or circumduction. In the early stages there may be some limitation of active movements above the horizontal plane but a full passive range is usually present in the extreme range.

Figures 4 and 5 is deliberately left in anatomic terms, eschewing traditional nomenclature, to encourage the reader to approach treatment in a logical and scientific manner. Note that in Figure 5 the muscles shown on the right side of the figure are deeper than those shown on the left side. Care should be exercised in treating deep points to avoid iatrogenic pneumothorax. The apex of the lung, especially in thin subjects, lie vulnerable to damage. It is well to occasionally refresh one's memory of the anatomy of the region by consulting anatomy texts. Note also that when points are identified in neuroanatomic terms, movement of the scapula over the thorax does not affect their accurate identification as it might do when using traditional terms based on surface anatomy. In C3 and C4 radiculopathy, the patient may have referred pain in the mid-dorsal back because of the lower trapezius motor points. This region is often wrongly suspected by physicians when the problem is in the neck. Not shown in the figure are the intermediate muscles: Serratus posterior and superior and deep muscles; splenius capitis and cervicis (4th layer); longissimus cervicis and capitis; semispinalis capitis, cervicis, and dorsalis; multifidus and interspinales. All these muscles have motor points which may require treatment. Equally, on the side and front of the neck are the sternomastoid, the scalenus medius and anterior, the suprahyoid and infrahyoid groups and the anterior vertebral muscles. Fortunately, (since there is a natural hesitancy to insert needles in the front of the neck) these muscles are not as frequently tender as those on the posterior aspect.

Injections of saline or local anesthetic with or without cortisone have been advocated by some practitioners, but we have found these not to be significantly superior to accurate needling. Following needle insertion, the needle is moved in and out in a radiating manner. Palpable local muscle spasm (of recent origin) quickly disappears, but in longstanding cases where a fibrotic reaction<sup>17</sup> has occurred, the palpable mass remains though the hypersensitivity and tenderness usually resolve after one or more treatments.

Patients who fail to improve with acupuncture may be considered to have persistent structural changes in the cervical spine, either osseous or soft tissue or there may have been cord compression and ischemia leading to myelopathy.<sup>1</sup>

If the pain is referred to the shoulder, early supportive treatment to maintain joint mobility or by a passive or assisted range of motion daily may be necessary. The use of a sling in such cases is contra-indicated as it may lead to a stiff shoulder.

(b) *Surgical Treatment:*

There are two main groups of patients which present for surgery:

- (i) Radicular symptoms related to the nerve roots with intermittent neck and arm pain and *progressive* sensory or motor loss, usually in one arm. However, the relatively young patient who develops symptoms following an acute twist of the neck or the maintenance of the neck for a protracted period of time in an unnatural position are excluded as they usually respond to conservative management. Surgery is only indicated when conservative treatment, including acupuncture, has failed.
- (ii) The development of gradually progressive spastic quadriparesis or of episodic deterioration of spastic weakness in the arms and legs, together with unsteadiness of gait, are indicative of deteriorating myelopathy.

For further information, the reader is referred to other references.<sup>1/18</sup>

### References

1. Wilkinson, M.: *Cervical Spondylosis, Its Early Diagnosis and Treatment*. Saunders, Philadelphia, 1971. pp. 1-9, 35-57, 140-147, 154-155.
2. Irvine, D. H.: Prevalence of Cervical Spondylosis in a General Practice. *Lancet*, 1, 1089-1092. et al. 1965.
3. Nurick, S.: *The Cervical Spine & Paraplegia. Modern Trends in Neurology*. Butterworths, Vol. 6, 1975. pp. 167-183.
4. Logue, V.: *Cervical Spondylosis—Modern Trends in Diseases of the Vertebral Column*. Butterworths, London, 1959. pp. 174-191.
5. Moseley, H. F.: *Shoulder Lesions*. Churchill Livingstone, Edinburgh & London, 1972. pp. 260-281.
6. Chusid, J. G.: *Correlative Neuroanatomy & Functional Neurology*. 15th ed., pp. 196-201, p. 237.
7. Caillet, R.: *Neck and Arm Pain*. F. A. Davis, Philadelphia, 1974. pp. 20-25, 60-70.
8. Caillet, R.: *Shoulder Pain*. F. A. Davis, Philadelphia, 1974. P.ix, 97-100.
9. Gunn, C. C., W. E. Milbrandt: Tennis Elbow and the Cervical Spine. *Canadian Medical Association Journal*, Vol. 114, May 8, 1976, p. 803-809.
10. Travell, J., and S. H. Rinzler: Pain Syndromes of the Chest Muscles: Resemblance to Effort Angina and Myocardial Infarction & Relief by Local Block. *Canadian Medical Association Journal*, October, 1948, 59:333.
11. MacNab, I., D. Hastings: Rotator Cuff Tendinitis. *Can. Med. Ass. J.*, Vol. 99, No. 3, pp. 91-98.
12. Gunn, C. C., W. E. Milbrandt: Tenderness at Motor Points—A Diagnostic and Prognostic Aid for Low Back Injury. *J. Bone & Joint Surg.*, Vol. 58A, No. 6, Sept. 1976, pp. 815-825.
13. Gunn, C. C., Milbrandt, W. E.: Some Observations on the Nature of Trigger Points. *Orthopedic Physician*, March 1977
14. Coers, C., A. L. Woolf: *The Innervation of Muscle: A Biopsy Study*. Blackwell Scientific Publications, Oxford, England, 1959.
15. Gunn, C. C., et al.: Acupuncture Loci: A Proposal for Their Classification According to Their Relationship to Known Neural Structures. *Am. J. Chin. Med.*, Vol. 4, No. 2, 1976, pp. 183-195.
16. Gunn, C. C.: Transcutaneous Neural Stimulation, Needle Acupuncture & the Teh Ch'i Phenomenon. *Am. J. Acupuncture*, Vol. 4, No. 4, October-December 1976, pp. 317-322.
17. Simons, D. G.: Special Review—Muscle Pain Syndromes. *Am. J. Phys. Med.*, Vol. 54, No. 6, 1975.
18. O'Connell, J. E. A.: Discussion on Cervical Spondylosis. *Proc. R. Soc. Med.*, 49, 20-208, 1956.