

## Dorsal Thoracic Pain

### Splenius Cervicis and Levator Scapula Syndromes. Notalgia paresthetica

Jean-Yves Maigne, MD, Physical Medicine, Hotel-Dieu Hospital, 75181 Paris Cedex 04, France

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The cervical spine may be the source of many pain syndromes, including : neck pain, headaches of cervical origin, cervical radiculopathies, upper thoracic pain and even shoulder and elbow pain. This paper deals with the referral of cervical pain to the upper part of the thorax. The major point is that in this case, the pain is felt at the thoracic level and not in the neck (or at a lesser extent). The clinical experience leads to the description of two different syndromes (in fact, very closed one from the other): the Splenius Cervicis syndrome, also known as interscapular pain of cervical origin and the Levator Scapula syndrome.

The unexpected referral pattern is due to the distribution of the nerves and to the presence of two particular muscles the Splenius Cervicis and the Levator Scapula), which seem to transmit the pain to their lower attachment.

## Anatomy: Course of the lower dorsal rami

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Just after its exit from the intervertebral foramen, each of the four lower cervical roots (C5 to C8) subdivides into ventral and dorsal rami.

The dorsal ramus, after a short course, passes through a vertical opening limited cranially and caudally by the transverse processes of two contiguous vertebrae, medially by the zygapophyseal process and laterally by the intertransverse ligament. This opening allows easy passage of the nerve. It separates the ventral and the dorsal compartments (regarding the nerve and vascular supply) of the spine. Upon emerging from this passageway, the dorsal ramus subdivides into lateral and medial branches. The lateral branch runs caudally and laterally and supplies the lateral cervical muscles. The medial branch runs dorsally in the angle between the transverse and the zygapophyseal processes of the corresponding vertebra and supplies the superior and inferior facets. Each facet is therefore innervated by two different nerves. The medial branch continues its course by following the lamina and the spinous process and supplies the corresponding periosteum and the inner compartment of the neck muscles. Then, it reaches the apex of the spinous process of the corresponding vertebra. Up to C5, the medial branch becomes superficial at this level by passing through the tendons of the neck muscles and spreads out laterally, innervating the skin of the neck. The dorsal cutaneous rami of C5 and T1 are only present in 30-50% of the cases, according to Lazorthes, a French neuroanatomist. The cutaneous branches of C6, C7 and C8 are either very short and thin or do not exist at all. In most cases, the medial branch terminates at the apex of the spinous process.

T2 has a dorsal cutaneous branch (medial branch) supplying a large strip of skin extending up to the acromion. Consequently, on the trunk, the dermatomes C4 and T2 are neighbors. It could be hypothesized that during embryologic development, the dermatomes C5 to T1 are drawn out into the upper limbs, whose sensitivity is highly developed, thus there is no dorsal dermatome for these roots (R. Maigne). The same phenomenon is observed in the lower limb (the L1 and S1 dorsal dermatomes are contiguous as there is no dermatome supplied by L2 to L5) and in the face (no dorsal dermatome between C2 and the trigeminal nerve).

## **Pain patterns from the cervical spine to the thorax: experimental data**

The following is a summary of the data pertaining pain referral from the cervical spine to the upper thoracic and periscapular region.

### **a) Clinical observations**

The connection between the upper thoracic/interscapular region and the lower cervical spine is acknowledged in cases of cervical radiculopathy, as the acute or chronic phase of

this condition is often accompanied by upper thoracic pain. The same pain referral is observed in the rare cases of tumors of the cervical medulla.

Cloward, while performing cervical discographies in patients with radicular pain, noted several cases where pain referred to the upper thoracic/interscapular region, either medially or laterally, during injection of contrast into the affected disc [Cloward, 1960]. More precisely, the needling and stimulation of the posterolateral part of the anulus of the lower cervical discs referred pain to the shoulder and radiation into upper arm, i.e. a radicular pain, when the stimulation of the anterior part of the anulus selectively referred pain to muscles along the vertebral border of the scapula or in the middle of the back. According to Cloward, the involved muscles could be the Levator Scapula in the first case, the Rhomboideus major and minor in the second. This author gave two possible explanations: the sclerotomal correspondence between the stimulated disc and the muscles (C3 to C5) or the fact that "embryologically, the ventrolateral sheath of musculature of the lower cervical region undergoes subsequent migration to obtain a secondary skeletal attachment to the vertebral column at a considerable distance from its origin". Periscapular pain is also a frequent adverse reaction to incorrect cervical manipulation.

## b) Experimental studies

Dwyer et al [Dwyer et al, 1990] have presented the patterns of pain referral from the cervical facets in normal volunteers. Injection of the lower facet joints (C5-6 and C6-7) lead to pain radiating to the posterior shoulder, the scapula or the upper thoracic spine, varying according to the injected level.

## Thoracic pain syndromes from the cervical spine: interscapular pain

Two thoracic pain syndromes from the CTJ have to be described: lateral upper thoracic pain and interscapular pain. Interscapular pain will be studied first, as it is much more frequent.

Thoracic interscapular pain is a very common complaint especially in women, where it is often considered to be psychogenic. However, although women may perhaps have this type of involvement more often than men, it is seen in both genders and at all ages. The ensuing disability varies with the profession (e.g. typists). An essential point is the usual cervical origin of the pain, which has a clinical stereotyped picture of interscapular vertebral pain. This cervical origin of interscapular thoracic pain was acknowledged by [Robert Maigne in 1964 \[Maigne, 1964\]](#).

Usually, the pain is experienced as a very painful point between the scapulae, at T4 or T5. This point is felt either medially, or slightly laterally, with both sides being equally involved. It can be accompanied by cervical pain or present in isolation. The pain is sometimes increased by prolonged neck flexion, working at a desk or data entry. Ipsilateral rotation or side bending of the cervical spine may be painful.

The physical examination reveals the same signs in all cases. These include both thoracic and cervical signs.

### a) Thoracic signs

**The interscapular point:** Palpation reveals a specific tender point or zone, always close to the apex of the spinous process of T4 (i.e. seen on fluoroscopy to overly the body of T5), localized to either the right or left side (Fig. 1). The pressure of the palpating finger must be directed obliquely, toward the lateral aspect of the spinous processes, and not sagittally, toward the facets. This point is very tender in a localized area and pressure on it reproduces the familiar periscapular pain (Fig. 2).

Fig. 1

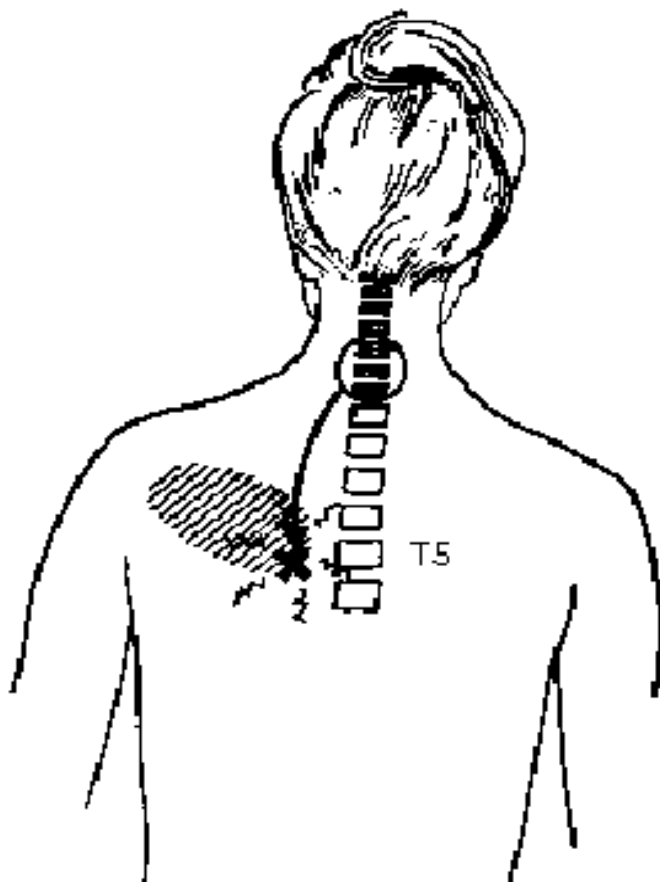


Fig. 2



**Cellulalgia:** The other clinical sign is the presence of an area of skin, that may appear slightly thickened, that is always extremely sensitive to the pinch-roll maneuver (cellulalgia). This area includes all or part of the cutaneous territory of the dorsal branch of the first and second thoracic nerves which extends to the acromion. This cellulalgia is located ipsilateral to the periscapular point.

## b) Cervical signs

The patient lies supine and relaxed with the head gently supported by the physician's hands. Palpation of the cervical spine (segment by segment, one side after the other) reveals tenderness of one (occasionally two) segments, often C5-6, or C6-7, ipsilateral to the periscapular point. In the absence of a diagnosis such as disc herniation, this tenderness is supposed to correspond to a minor mechanical dysfunction of the motion segment caused either by a disc or a facet disorder. In other cases, the cause can be an acute inflammation of an osteoarthritic segment or event the starting phase of a disc herniation.

## c) Response to treatment

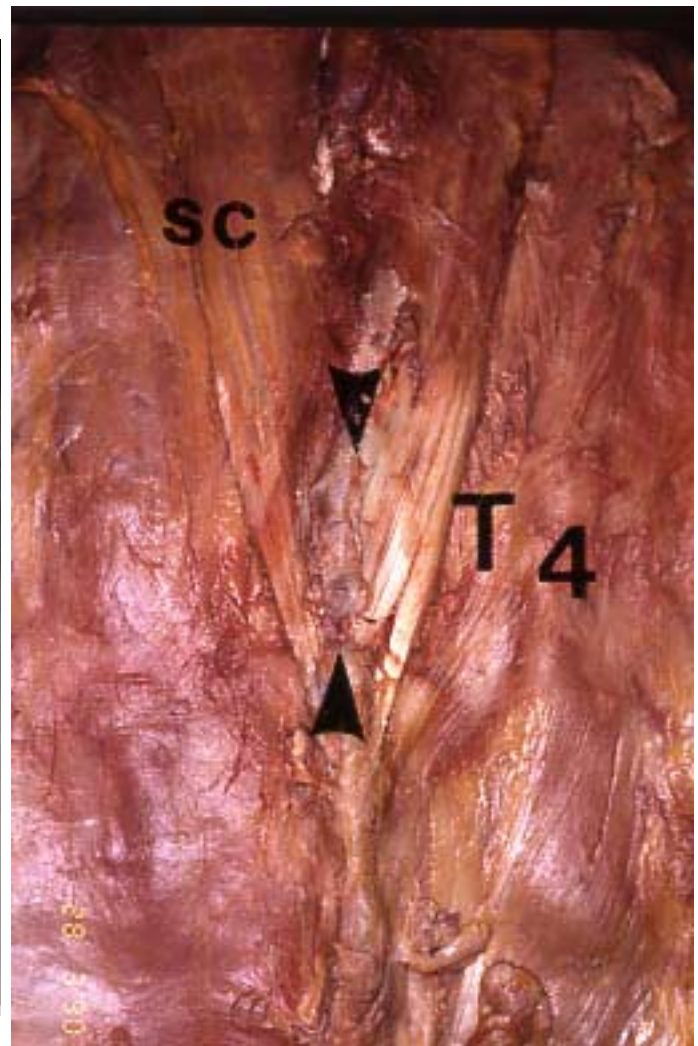
In addition to these findings, assessment of the response to treatment is important. Thus, in many cases, cervical manipulation leads to resolution of the cervical dysfunction and the accompanying signs and symptoms. The sensitivity of the overlying skin to the pinch-roll test clearly decreases. This relief may occur instantly, whereas in some cases, three to five sessions may be required.

## d) Connection between the interscapular point and the lower cervical spine

There is no obvious anatomical link between the interscapular point and the lower cervical spine. We can only hypothesize the following facts. In our opinion, the interscapular point could correspond to the distal attachment of the Splenius Cervicis (the splenius of the neck, to be distinguished from the Splenius Capitis, the splenius of the head). This muscle shares its proximal attachment to the upper two or three cervical transverse processes with the Levator Scapula. Its major distal attachment (as we were able to observe it in a [personal series of 17 dissections](#)) is to the lateral aspect of the spinous process of T4. The distal attachment extends to the interspinous ligaments above and below (T3-4 and T4-5), with some tendinous fibres inserting also on the spinous processes of T3 and T5. This attachment does correspond closely to the clinically painful spot, as it has been demonstrated by us in a radiologic study (the patients being X-rayed with a metallic mark over the tender point) (Fig. 3, 4).

**Fig. 3:** The metallic mark projects on the body of T5 and corresponds to the spinous process of T4.

**Fig. 4:** The muscle Splenius Cervicis inserts precisely on the lateral aspect of that spinous process.



In our opinion, this insertion is the only one which could correspond to the precise location of the interscapular point. Other muscles insertions are spread out over several vertebral levels or over too large an area. The Splenius Cervicis is supplied by the dorsal rami of C5, C6, C7 [Gray, 1993]. These levels correspond to the level involved by the cervical dysfunction. Thus, it appears that the interscapular point could correspond to an insertional pain of a “spasmed” or “tensed” or tender muscle. The mechanism for the presence of cellulalgia in the dermatomes of T1 and T2 is more difficult to understand. R. Maigne suggests the following explanation. On the trunk, the dermatomes C4 and T2 are neighbors, because during embryologic development the dermatomes C5 to T1 are drawn out into the upper limbs. The cutaneous branches of the lowest cervical spinal nerves are described as being vestigial or nonexistent. It is possible that at the thoracic level, the cutaneous dorsal branch of T2 represents the sensory supply for the lower cervical levels (C5, C6, C7, C8, T1).

### e) Treatment

The treatment for this type of back pain is applied at the cervical level, no matter what the pathogenic mechanism might be. Treatment options include manipulation, anti-inflammatory agents, injection of the involved cervical facet, or the use of physiotherapy

(collar, short wave diathermy, etc...) The modality is depending upon the cause of the pain. It is our opinion that, at any level of the spine, two basic mechanisms can affect the motion segment to determine non radicular pain. The first mechanism is mechanical and can consist, for example, in tears within the anulus or depressurization of the nucleus. The second mechanism is inflammation (which may be attributed to osteoarthritis in many cases). In this latter case, when the inflammation is acute, only drugs (NSAIDs, cortisone or local injections) may be efficient. In the first case, manipulation can be the best treatment modality, provided the primary lesion is not too active (which would lead to a rapid relapse of the pain). This could be specially the case when a tear is on the way of healing for example.

**- Manipulation.** Spinal manipulation is a very effective therapeutic tool for the treatment of upper thoracic pain of cervical origin. We use three basic maneuvers acting on the lower cervical spine: rotation, lateral flexion and the "chin-pivot", a maneuver combining rotation, extension and lateral flexion. Because the hypothesized mechanism of the pain (a "spasm" of the muscle splenius cervicis), we also use manipulations with a stretch of the upper thoracic spine in flexion, which stretches the muscle. Usually, one to three sessions are sufficient. If there is no result after the second session, treatment by manipulation should be abandoned.

**- Antiinflammatory treatments.** If manipulation is not applicable (lack of improvement, technical contra-indication such as stiff neck or pain with mobilization), antiinflammatory treatments present a suitable alternative, because the condition is likely due to an acute inflammation of one of the components of the motion segment (disc or facets). Other symptoms which should draw the attention are stiffness in the morning, sensitivity to modest antiinflammatory agents and frequent recurrences of the pain. These treatments consist in NSAIDs (first intention treatment), and facet injection or a short course of oral steroid in the more severe cases.

R. Maigne has described his own technique of cervical facet injection. The facet which is found to be tender to palpation has to be infiltrated. The injection may be performed with fluoroscopic guidance (this is the basic technique) but is readily conducted by palpation of landmarks alone. The patient is seated facing the examining table desk with the head resting forward on his crossed hands, thus flexing the neck in a relaxed position. The tender spot is carefully marked. The needle is inserted about ten millimeters from the midline, in the centre of the spot and is entered until periosteum is contacted. After aspirating to ensure that the needle is not intervascular the injection itself should be easy and without resistance or pain. We inject 1 or 2 cc of corticosteroid (Hydrocortancyl\*), without any local anesthetic. Anesthetic block of the joint *without fluoroscopy guidance* could be very risky and is strongly contraindicated. This technique is suitable for every cervical facet joint from C2-3 to C7-T1. The patient must be informed of a possible adverse reaction (increased pain) a few hours later, which can last up to 24 hours.

**- Physiotherapy.** Many empirical therapies can be used, including : cervical collars in cases of acute or post traumatic pain, short wave diathermy applied to the neck, ultrasound or massage applied to the Splenius Cervicis.

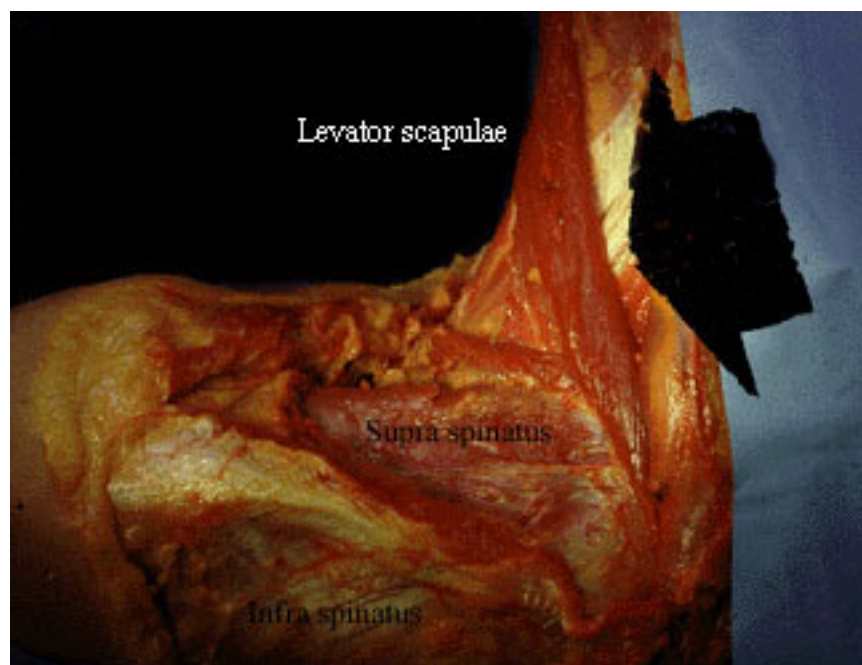
## Thoracic pain syndromes from the cervical spine: Lateral upper thoracic pain.

### The Levator Scapula syndrome

When a patient is suffering from neck pain, the pain often radiates to the superior angle of the vertebral border of the scapula. In other cases, only the radiation is present, without any neck complaint. In these cases, the Levator Scapula plays a role in the pain referral. In neck pathology, this syndrome, or the "Levator Scapulae Syndrome" involves the referral to the shoulderblade. The examination reveals the same thoracic and cervical signs in all cases. Of note, many patients complaint of a "painful shoulder". This should not mislead the physician. The pain originating from the shoulder is located on the lateral aspect of the shoulder, or lower in the arm. It is sometimes anterior. It is never a posterior pain, which is quite always cervical in origin.

#### a) Thoracic signs

**Fig. 5:** The Levator Scapula inserts on the inner border of the scapula. This point is often tender in cervical syndromes.





## b) Cervical signs

The position and the palpation technique has been described above. Palpation reveals a very tender vertebral level, which may be C3-4, C4-5 or C5-6, ipsilateral to the painful insertion. As for the Splenius Cervicis syndrome, this tenderness is supposed to correspond to a minor mechanical dysfunction of the motion segment caused either by a disc or a facet disorder or by an acute inflammation of an osteoarthritic segment. We have often noted the presence of a narrowed intervertebral foramen on the same side, at the corresponding level. Thus, in these cases, the Levator Scapula syndrome could be regarded as a C4 or C5 radiculopathy.

## c) Connection between the levator point and the cervical spine

There is no doubt about the nature of this point, which corresponds exactly to the distal attachment of the fibres of the Levator Scapulae to the superior angle of the scapula's vertebral border. Interestingly, this muscle shares its upper insertion on the superior cervical transverse processes with the Splenius Cervicis, both being derived from the same muscle in the embryo. Both are superficial, and innervated by the dorsal rami of the lower cervical roots (C4 to C6 for the Levator Scapula, C5 to C7 for the Splenius Cervicis). Thus, it appears that the Levator point could correspond to an insertional pain of a spasmed or painful muscle, due to a cervical painful dysfunction.

## d) Treatment

The treatment of the Levator Scapula syndrome is the same as that for interscapular pain of cervical origin.

## Thoracic pain syndromes from the cervical spine: Notalgia Paresthetica

**Notalgia Paresthetica** was first described by Astwazaturow in 1933 (cited by Bernard Pleet, [Bernard Pleet et al,1978]). Notalgia comes from a Greek root meaning "pain in the back". Six cases were recently published [Wayne Massey, 1981]. Clinically, notalgia paresthetica consists of pruritus and localized dysesthesia and hypesthesia in the distribution of one of the cutaneous dorsal rami of the upper thoracic area. The aetiology proposed was that of a neuropathy of the dorsal ramus of the second to sixth thoracic nerves. Our [previous anatomic studies](#) lends anatomical support for this hypothesis, because we observed compression of a nerve trunk in four cases. These compressions could be the cause of the pain and other related symptoms, although they are certainly much more frequent anatomically than clinically, regarding the rarity of this pathology.

We have encountered a few cases meeting these diagnostic criteria. There was a trigger point when pressing the lateral aspect of the spinous process, where the nerve is likely compressed by the tendons. Injection of local anesthetic at this point abolished the signs and symptoms. The presence of an anesthetic strip of skin in a dermatomal pattern confirms the neural blockade. We recommend treatment by injection with a corticosteroid. We have insufficient experience with this condition to determine whether surgery is an efficacious therapeutic option.

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