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MECHANICAL
INNOVATIONS

The Cervical Spine

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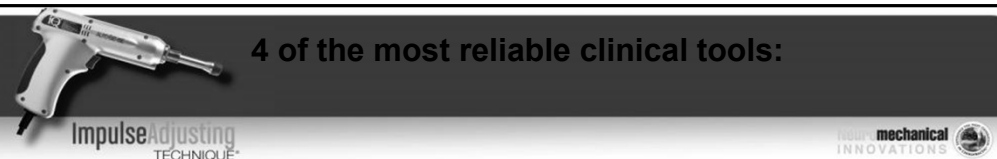
PATIENT HISTORY

Initial Hypotheses Based on Patient History

History	Initial Hypotheses
Patient reports diffuse nonspecific neck pain that is exacerbated by neck movements	Mechanical neck pain ¹ Cervical facet syndrome ² Cervical muscle strain or sprain
Patient reports pain in certain postures that are alleviated by positional changes	Upper crossed postural syndrome
Traumatic mechanism of injury with complaint of nonspecific cervical symptoms that are exacerbated in the vertical positions and relieved with the head supported in the supine position	Cervical instability, especially if patient reports dysesthesias of the face occurring with neck movement
Reports of nonspecific neck pain with numbness and tingling into one upper extremity	Cervical radiculopathy
Reports of neck pain with bilateral upper extremity symptoms with occasional reports of loss of balance or lack of coordination of the lower extremities	Cervical myelopathy

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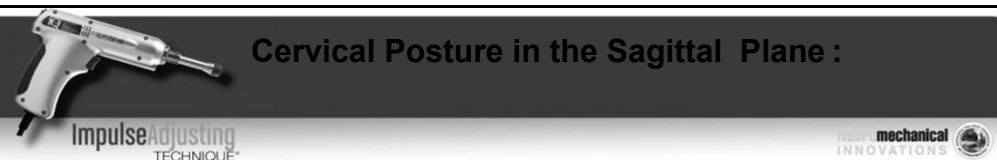


4 of the most reliable clinical tools:

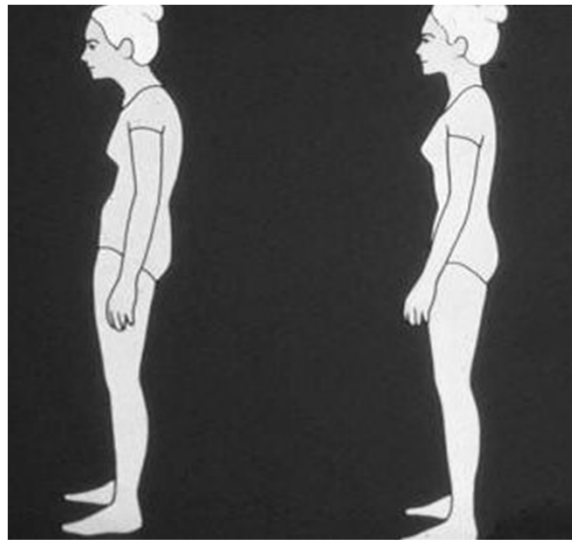
- 1. The Neck Disability Index**
- 2. Cervical Motion Testing**
- 3. Cervical Posture in the Sagittal Plane**
- 4. Assessment of the Deep Neck Flexors**

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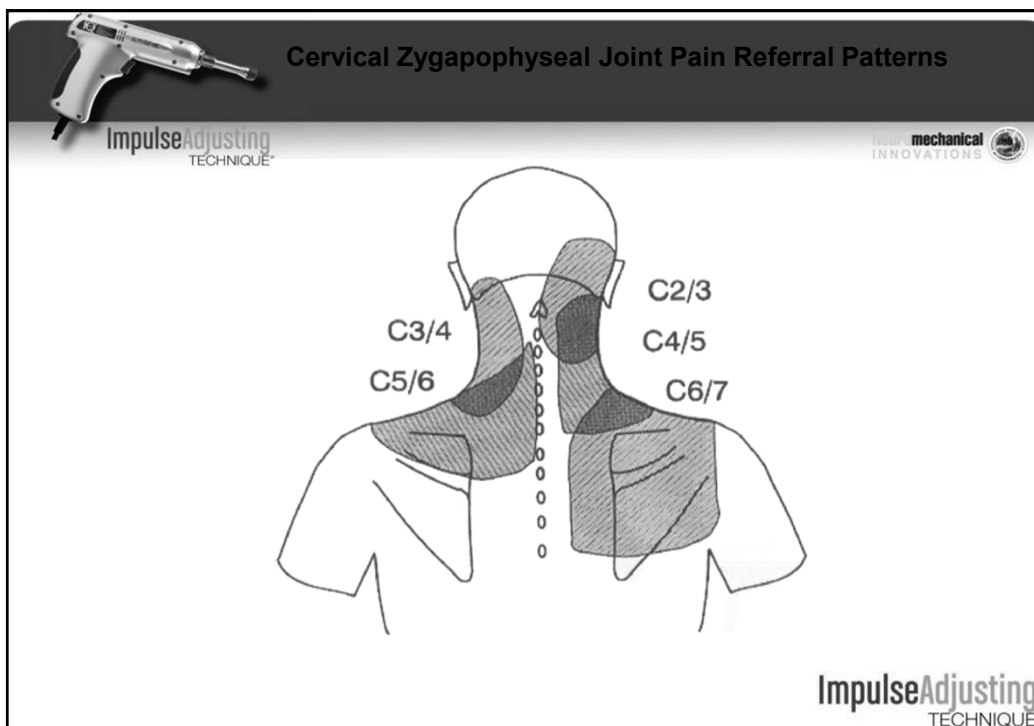


Cervical Posture in the Sagittal Plane :



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MANUAL THERAPY

Original article

Myofascial trigger points in the suboccipital muscles in episodic tension-type headache

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Abstract

Referred pain evoked by suboccipital muscle trigger points (TrPs) spreads to the side of the head over the occipital and temporal bones and is usually perceived as bilateral headache. This paper describes the presence of referred pain from suboccipital muscle TrPs in subjects with episodic tension-type headache (ETTH) and in healthy controls. Ten patients presenting with ETTH and 10 matched controls without headache were examined by a blinded assessor for the presence of suboccipital muscle TrPs. Diagnostic criteria described by Simons and Gerwin were adapted to diagnose TrPs, i.e. presence of tenderness in the suboccipital region, referred pain evoked by maintained pressure for 10 s, and increased referred pain on muscle contraction. Six ETTH patients (60%) had active TrPs and 4 had latent TrPs (40%). On the other hand, 2 control subjects also had latent TrPs. Differences in the presence of suboccipital muscle TrPs between both groups were significant for active TrPs ($P < 0.001$), but not for latent TrPs. Active TrPs were only present in ETTH patients, although TrP activity was not related to any clinical variable concerning the intensity and the temporal profile of headache. Myofascial TrPs in the suboccipital muscles might contribute to the origin and/or maintenance of headache, but a comprehensive knowledge of the role of these muscles in tension-type headache awaits further research.

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Keywords: Tension-type headache; Myofascial trigger points; Suboccipital muscles; Referred pain

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"A distinct pattern of myofascial findings in patients after whiplash injury," Murphy, *Archives of Physical Medicine and Rehabilitation*, 89:7, July, 2008

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85.1 % had positive trigger points in the semispinalis capitis muscle.

Reduced cervical ROM is a prominent finding.

Myofascial tension of the scalene muscles causes a functional thoracic outlet syndrome that may explain brachialgia.

Patients with whiplash display more trigger points in the semispinalis capitis muscle, which is localized in the upper neck, consistent with a C1-2 facet injury.

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"Suboccipital Headache,"

Murphy, *American Journal of Clinical Chiropractic*, Oct, 2012

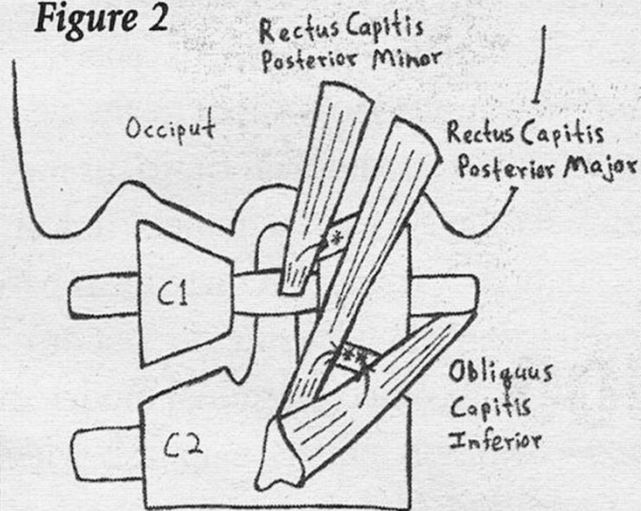
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"The apparent function of the attachment of the suboccipital muscles is to prevent the cervical spine dura mater from being mechanically irritated, injured, or inflamed during spinal motions."

"Mechanical dysfunctions of the upper cervical spine may compromise the ability of the suboccipital muscles to protect the dura mater from motion related stress."


"In chronic whiplash patients, injured suboccipital muscles may undergo atrophy and fatty infiltration."

Figure 2

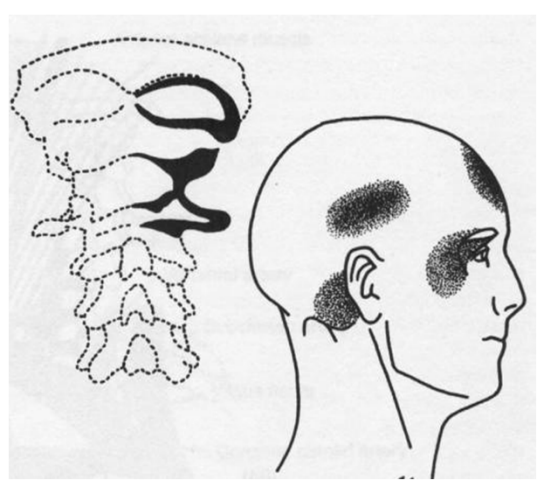


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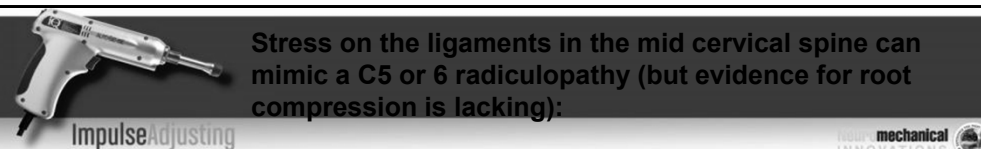
Dysfunction in the upper cervical and occipital region can refer to various areas of the skull:



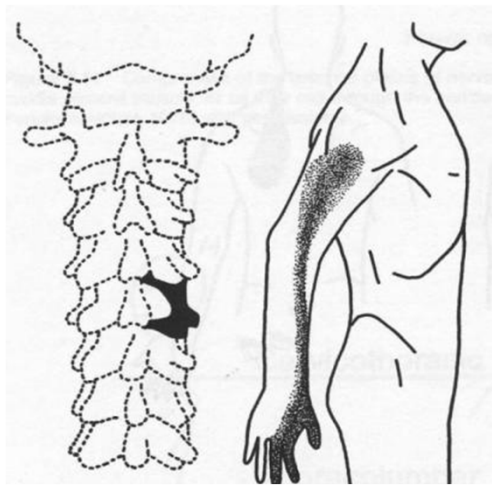

The Malalignment Syndrome: Implications for Medicine & Sport, Schamberger, 2002, Elsevier



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Stress on the ligaments in the mid cervical spine can mimic a C5 or 6 radiculopathy (but evidence for root compression is lacking):

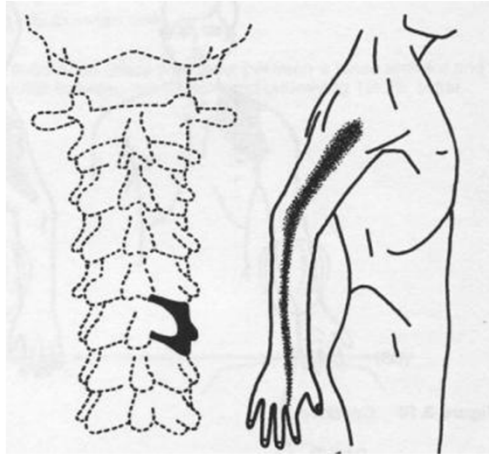
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Stress on the supraspinous and interspinous ligaments joining C7 to T1 can refer pain to the medial aspect of the forearm and the last 2 fingers, mimicking a C8 nerve root problem and even angina.

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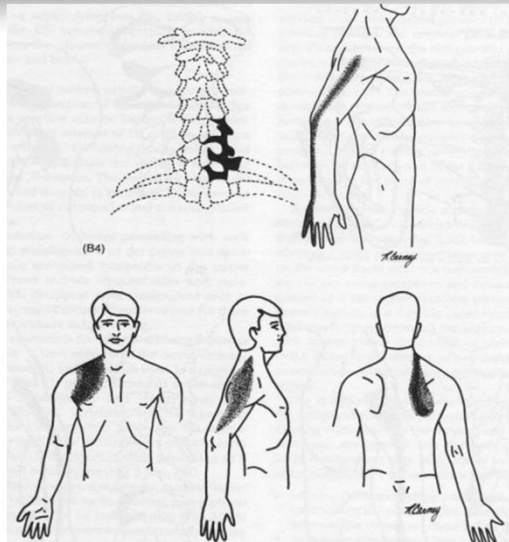
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Pain referral from dysfunction at C8/T1:


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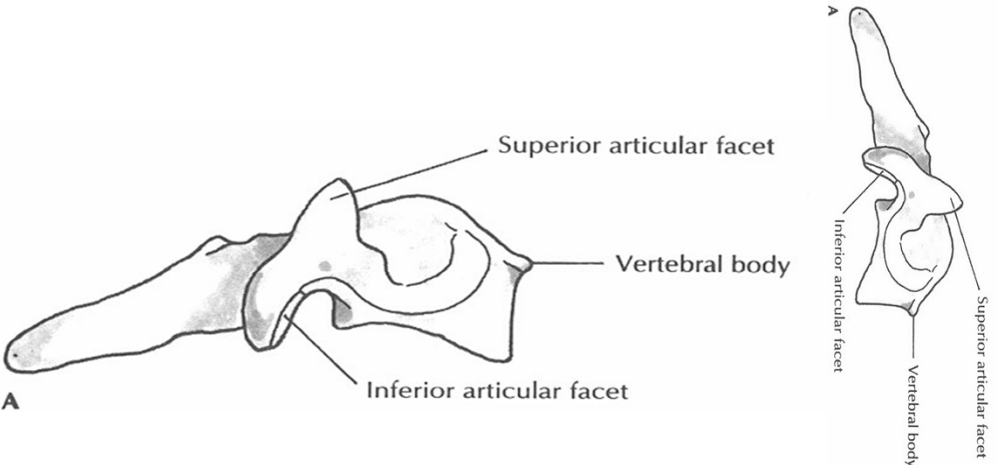


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The articular facets of C3 through C7 are oriented at 45 degrees to the transverse plane & parallel to the frontal plane.




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Kinematics of C3 through C7
Management of Common Musculoskeletal Disorders, Hertling & Kessler, 1990, Lippincott

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Rotation and lateral bending occur together to the same side (coupling).

“As one articular facet joint slides forward and upward, its mate slides backward and downward, translating to a sidebending component in the frontal plane and a rotatory component in the transverse plane.”

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Kinematics of Occiput-C1-C2

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Occiput-C1: 13 degrees of flexion-extension
8 degrees of lateral bending
10 degrees of axial rotation

C1-C2: 10 degrees of flexion-extension
0 degrees of lateral bending
65 degrees of axial rotation

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3 Cervical ROM Tests:

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- 1. Cervical compression test: Assesses ease of (or resistance to) movement into extension (lordosis).**
- 2. Cervical lateral flexion: assesses movement primarily from C3 to C7.**
- 3. Cervical rotation: assesses movement at C2-C1-Occiput.**

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1. Cervical Compression Test:



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Cervical compression test:

- Patient reports pain in upper neck or skull

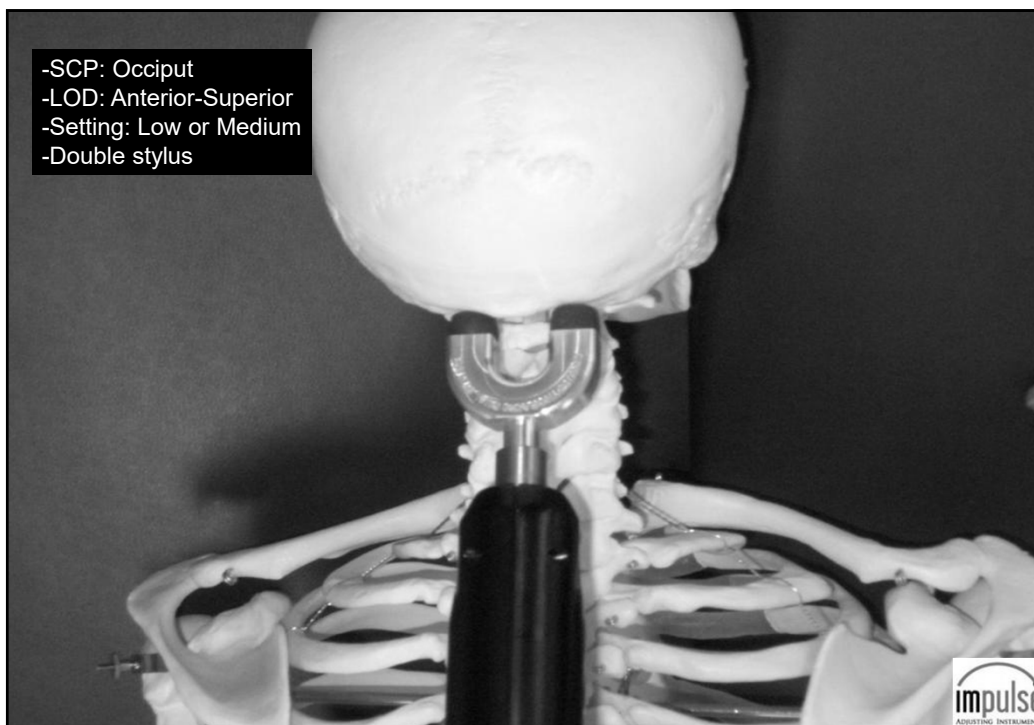
Analyze and adjust C2 and occiput with dual stylus, posterior to anterior.



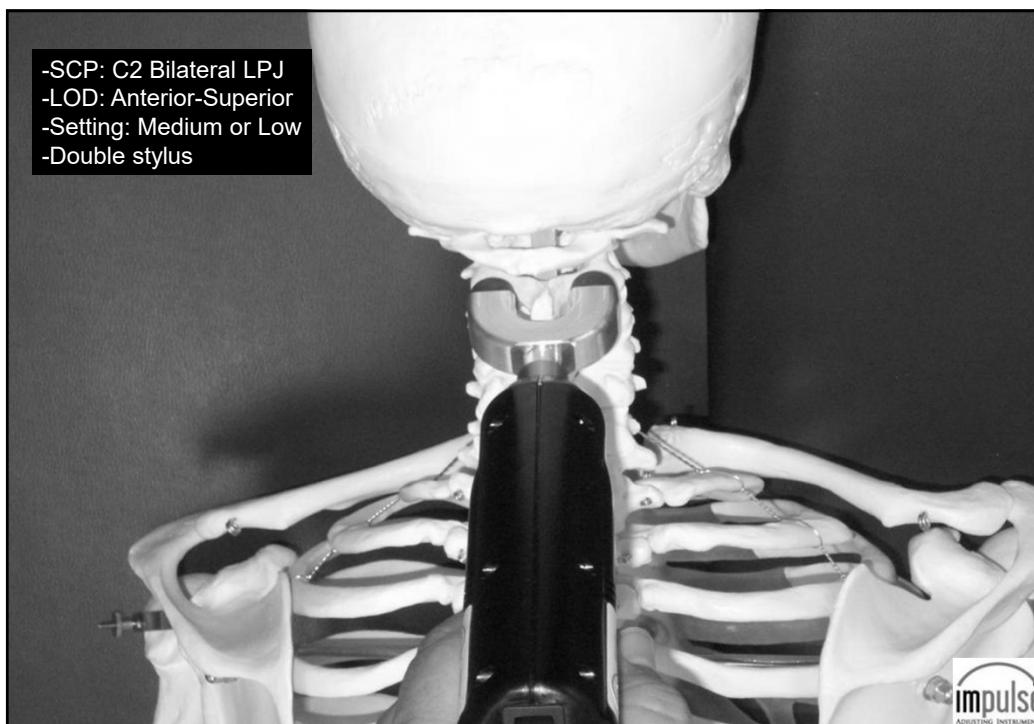
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- Upper cervical spine and/or occipital pain with the cervical compression test, adjust occiput and C2 with dual stylus:


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 **Cervical compression test:**

If cervical compression test produces pain in mid to lower cervical spine or upper back:

Begin at C7 and proceed up to C3 with small dual stylus, posterior to anterior.

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Cervical dual stylus adjustment to restore lordosis:
Functional adjusting to reduce forward head:

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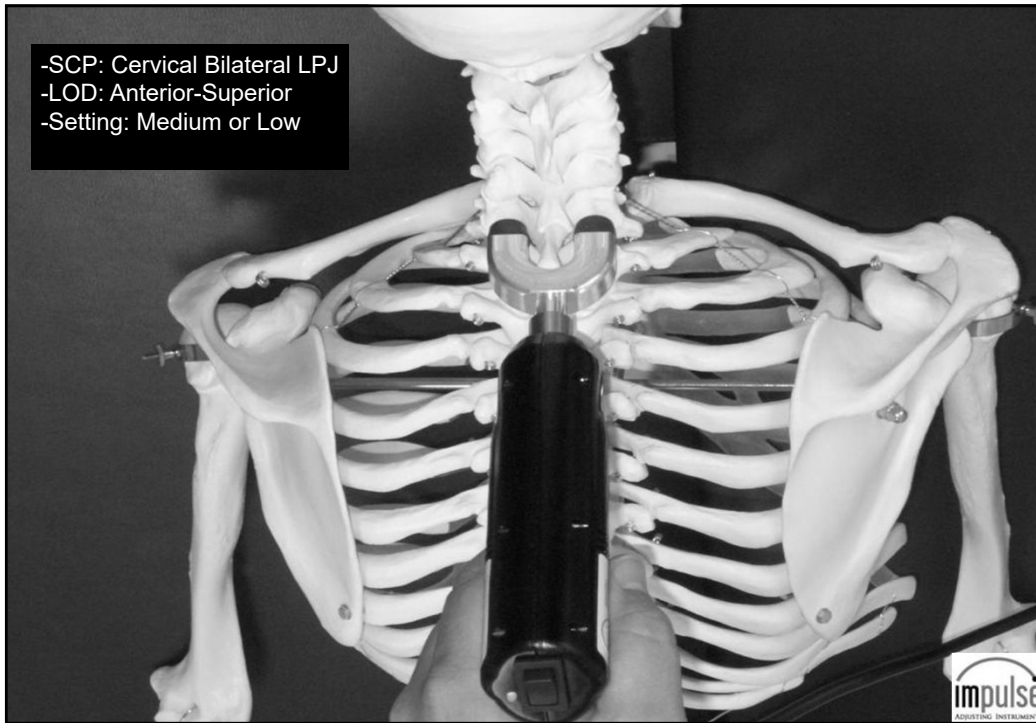
 **Cervical dual stylus adjustment**

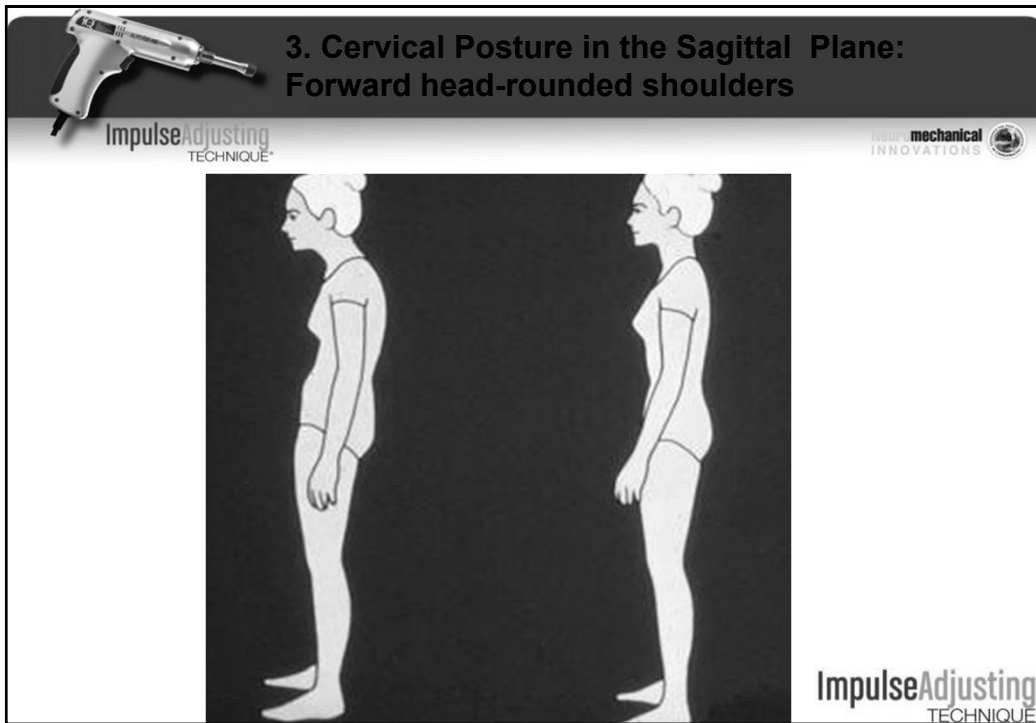


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2. Cervical Lateral Flexion Test:

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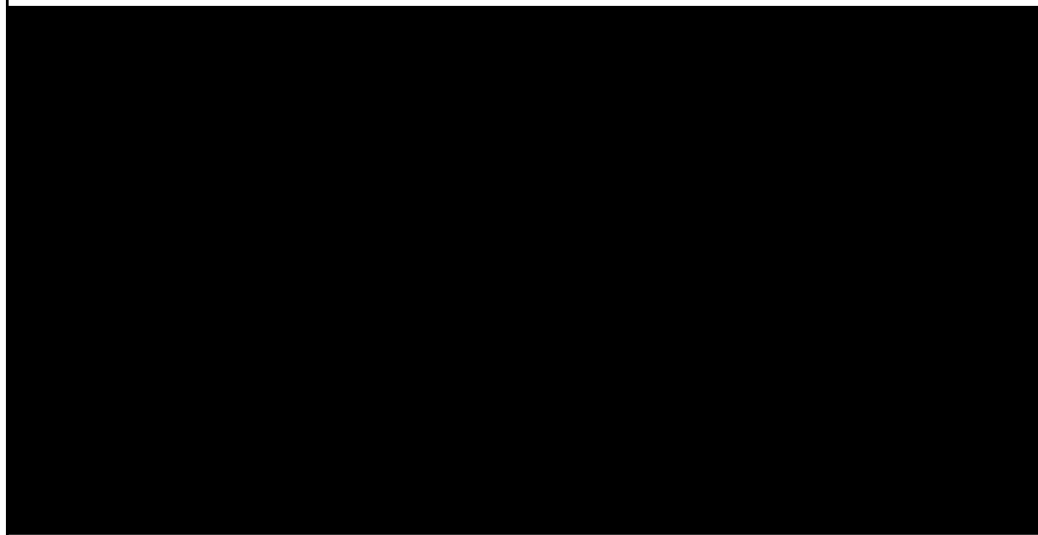
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Lateral Flexion and Axial Rotation are Normal Coupling Motions in Cervical Spine Kinematics

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Lateral flexion test for C3-C7:



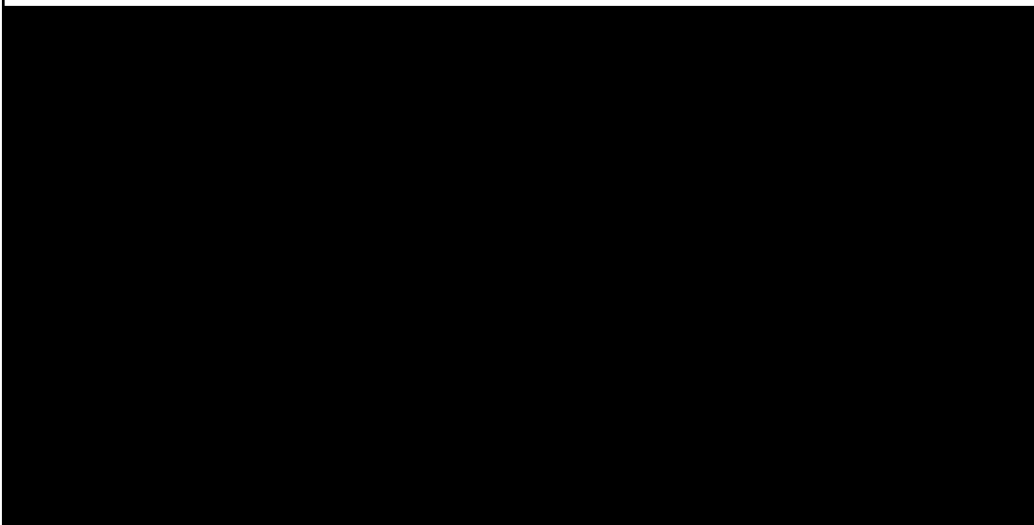
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Right cervical lateral flexion test for C3-C7:



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Adjustment of right C3 TP:



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Right C3-7 TP adjustment:



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3. Cervical Rotation Test:


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After C3-C7 has been cleared, proceed to the C2-C1-Occiput test:

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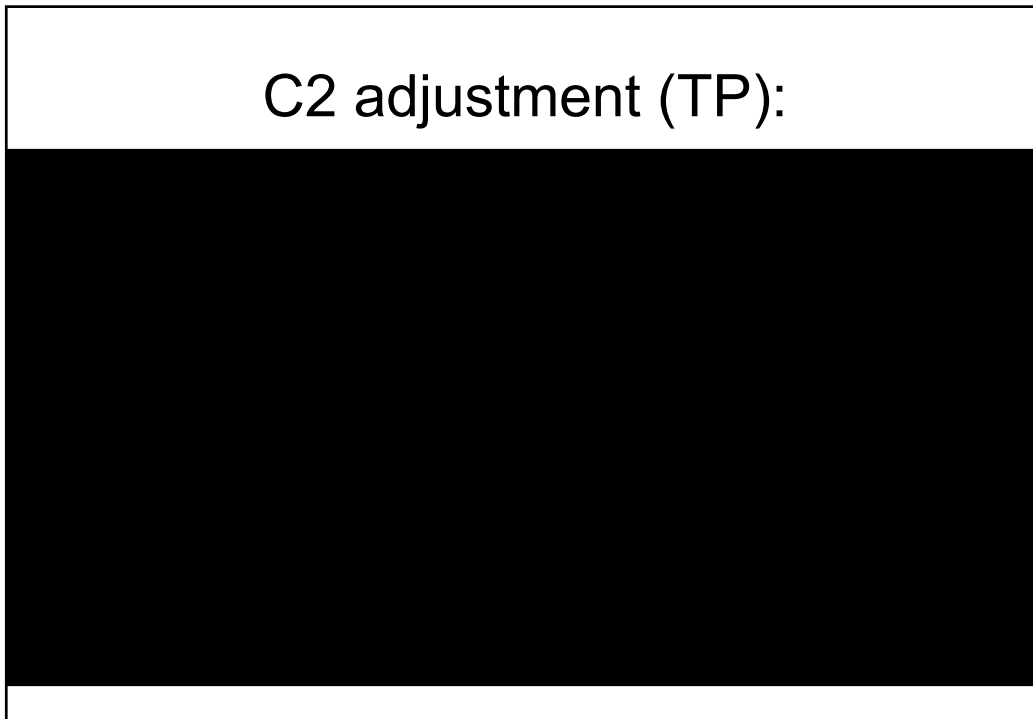
Cervical Rotation Test (for C2):



34



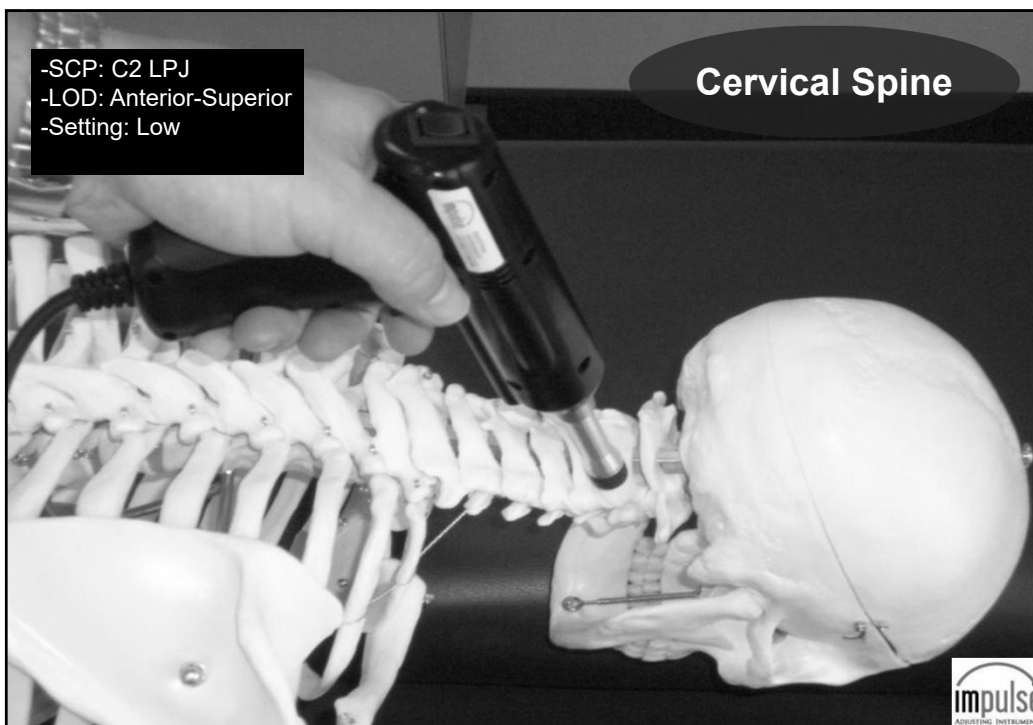
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“The Cervical Syndrome as a Cause of Migraine,”
Jackson, *Journal of the American Medical Women's Association*,
Dec, 1947

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96% of patients with cervical syndrome headaches will show subluxations at more than one level and in 77% the subluxation was of C2 on C3, irritating the C3 nerve root.

Cervical nerve root irritation of the C3 nerve is an etiological factor in migraine.

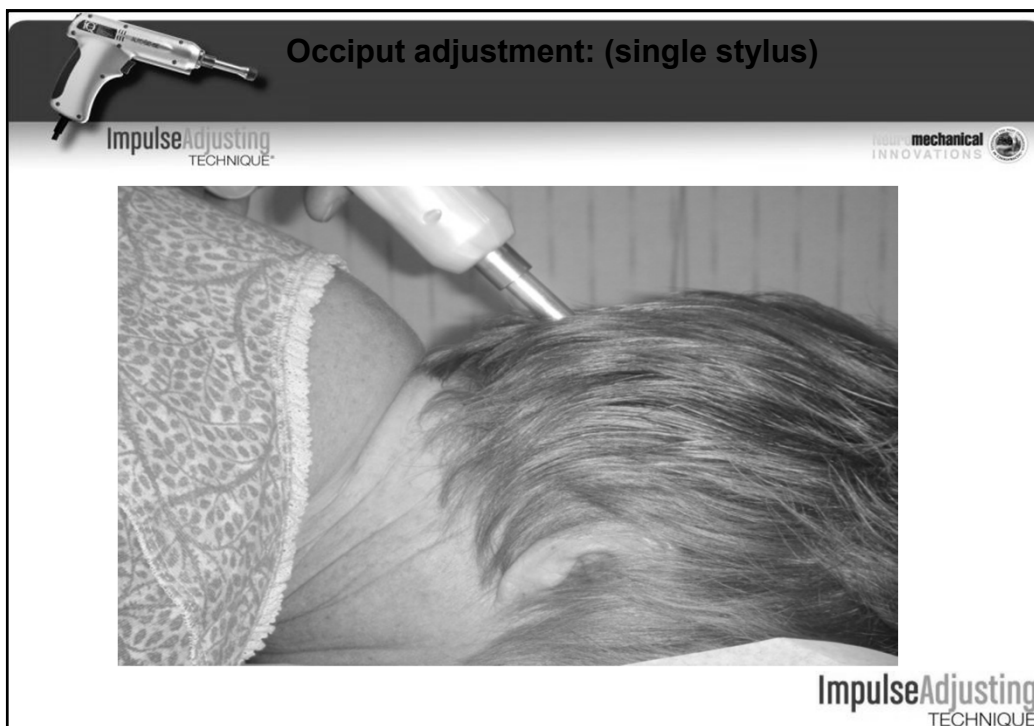
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- If rotation test is still restricted, adjust occiput on that side.

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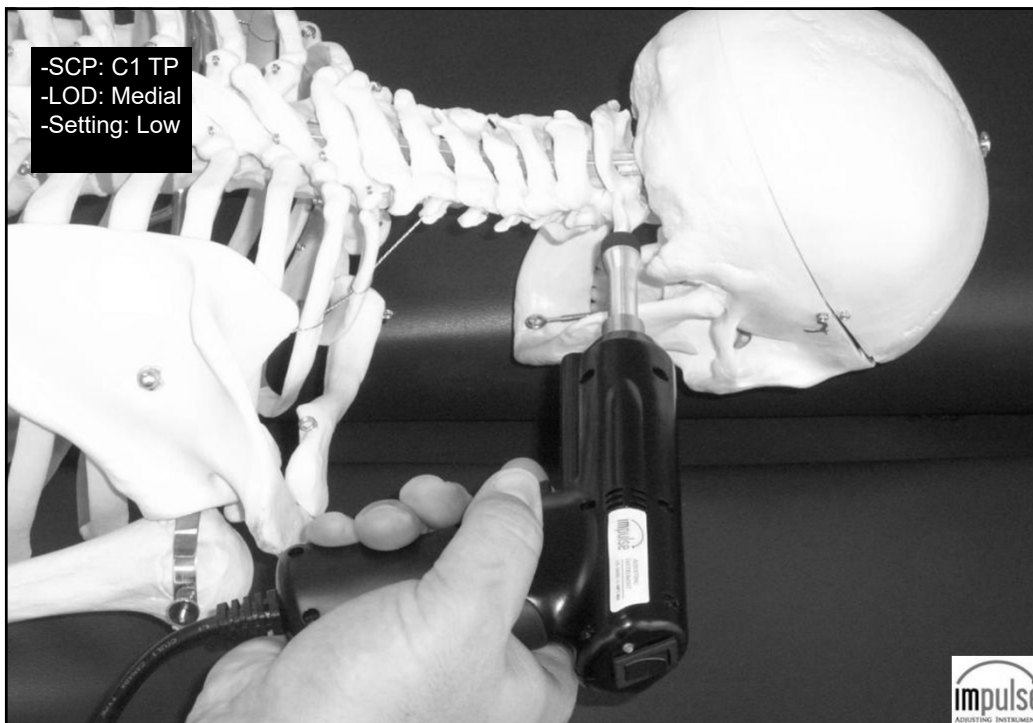
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- If rotation test still restricted, adjust C1 on restricted side.

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Muscles that hinder Occiput -C7 correction:



Scalenes

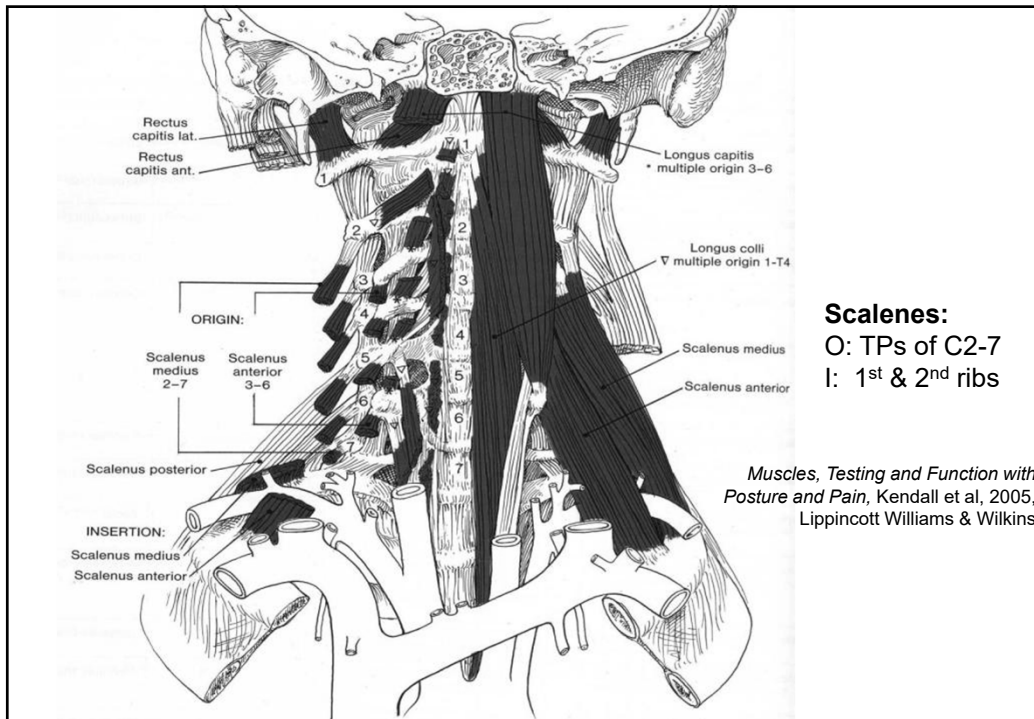
Upper Trapezius

Levator scapulae

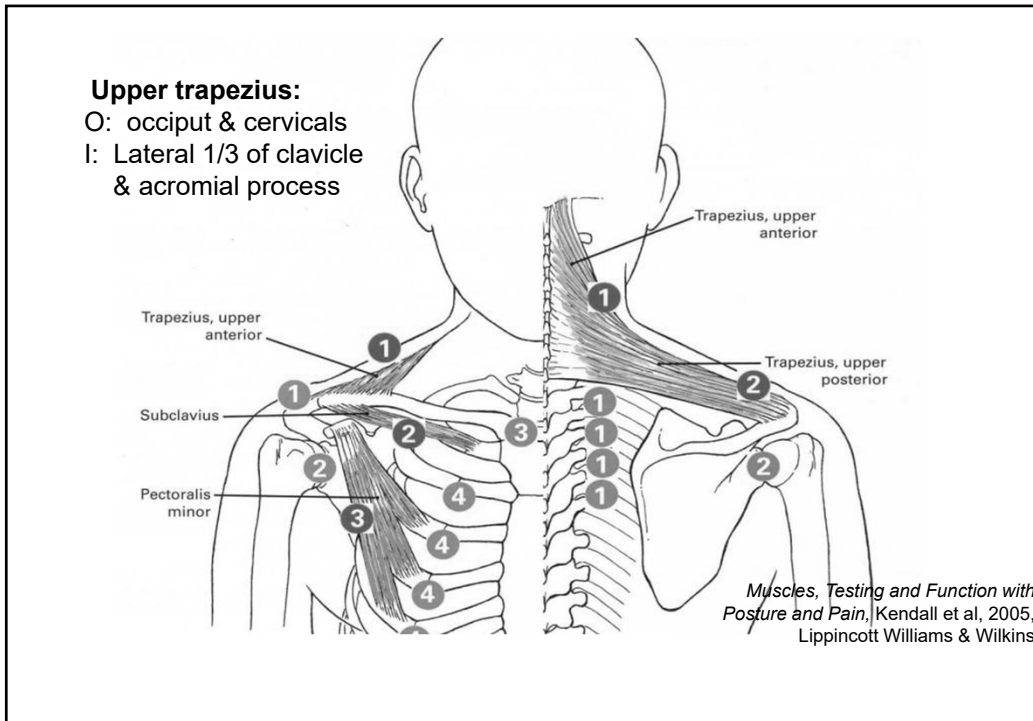
Splenius capitis



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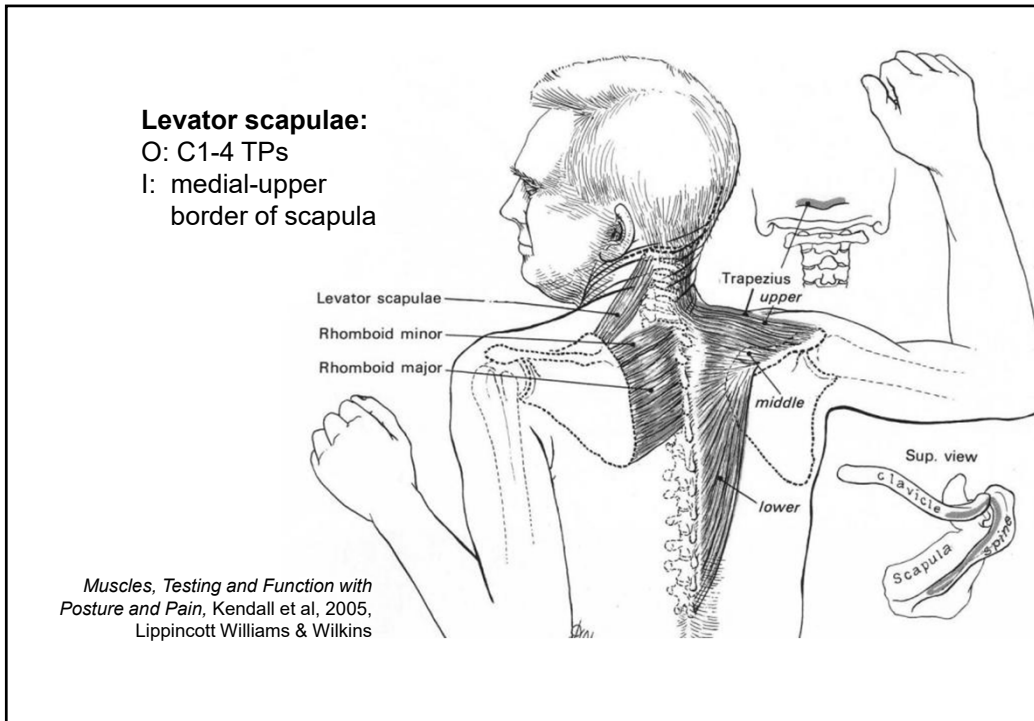
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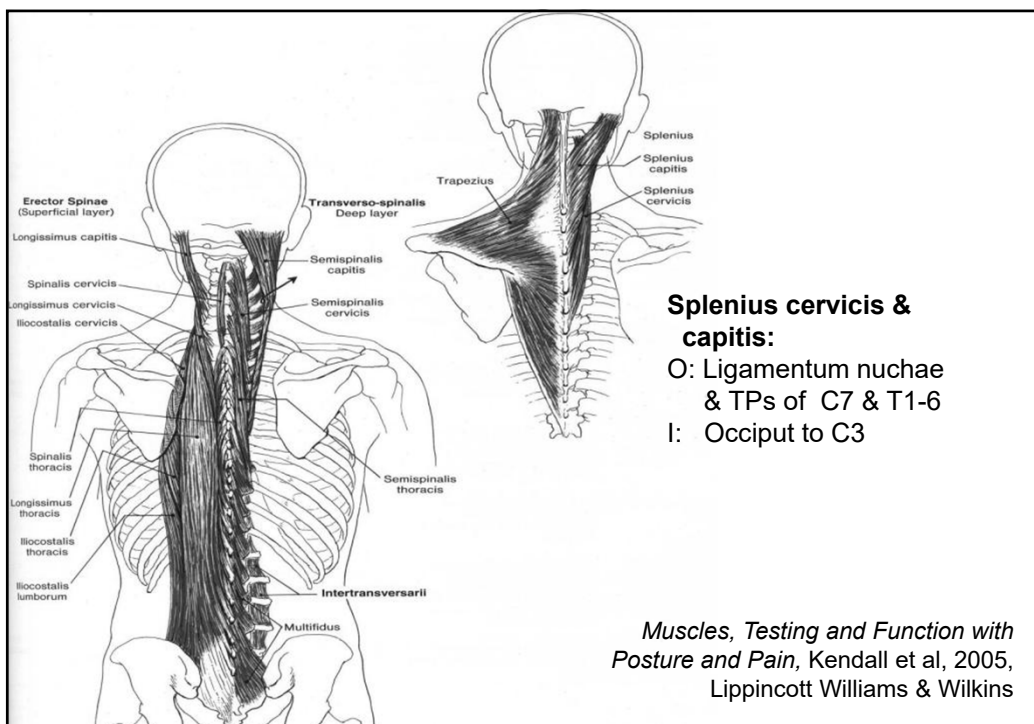


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Splenius test and adjustment:

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Upper thoracic compression test and adjustment

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 **Splenius test:**

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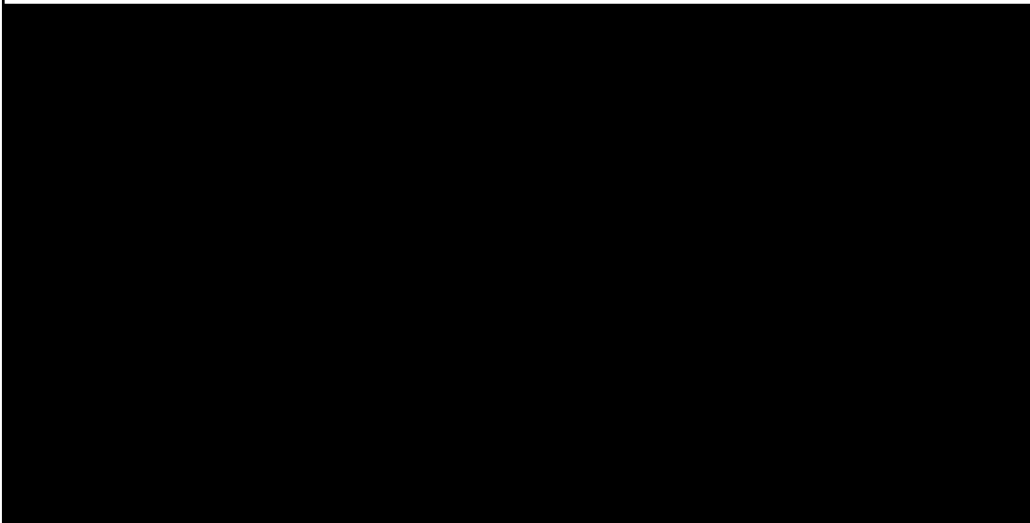
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Splenius adjustment:




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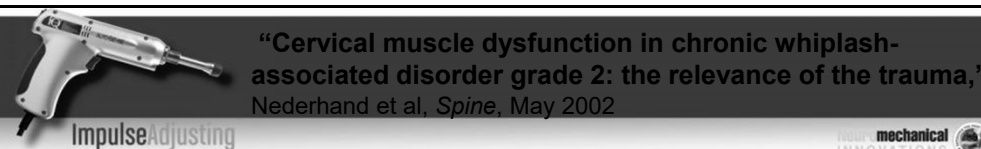
Cervicocranial Neck Flexion:



Weak **Strong**




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“Cervical muscle dysfunction in chronic whiplash-associated disorder grade 2: the relevance of the trauma,”
 Nederhand et al, *Spine*, May 2002

2. Upper Traps

Patients with neck pain demonstrate weakness and dysfunction of the upper trapezius muscles.



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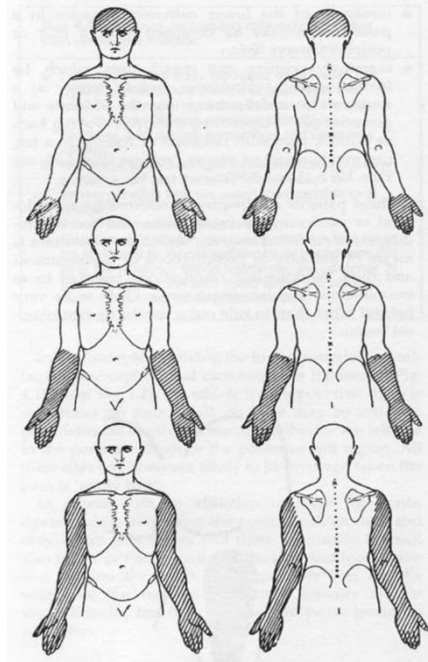
The Upper Thoracic Spine

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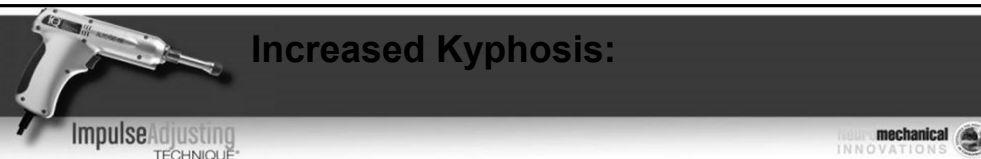
“T3 – T5 Syndrome”
Classical areas of pain
and paresthesia referral.

“The T4 Syndrome,” in Grieve, *Modern
Manual Therapy of the Vertebral Column*,
Churchill Livingstone, 1986

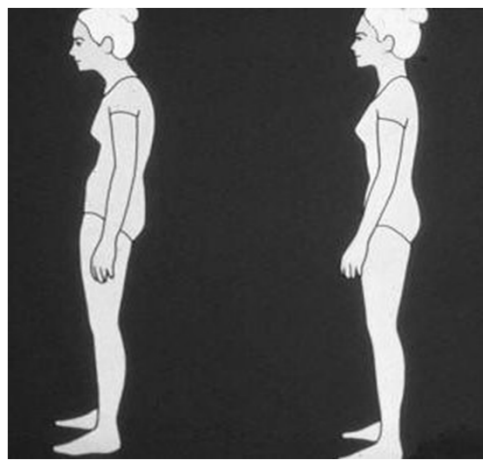


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Increased Kyphosis:



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Thoracic compression test: Unilateral over the TPs



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Thoracic compression test:

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Preferred compression test:

Due to the zygapophyseal joints of the upper thoracic spine (above the apex of the curve) being oriented in the frontal plane allowing primarily rotation (approx 8 degrees per segment from T1 to T7) and secondarily lateral flexion (approx 6 degrees per segment from T1 to T10, but limiting flexion).

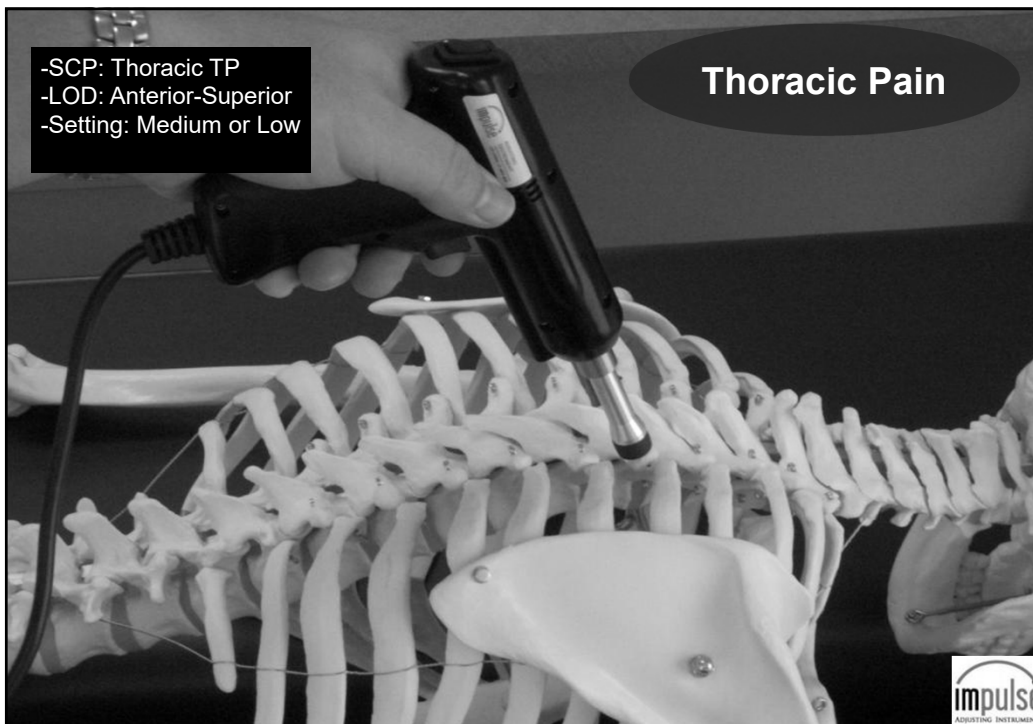
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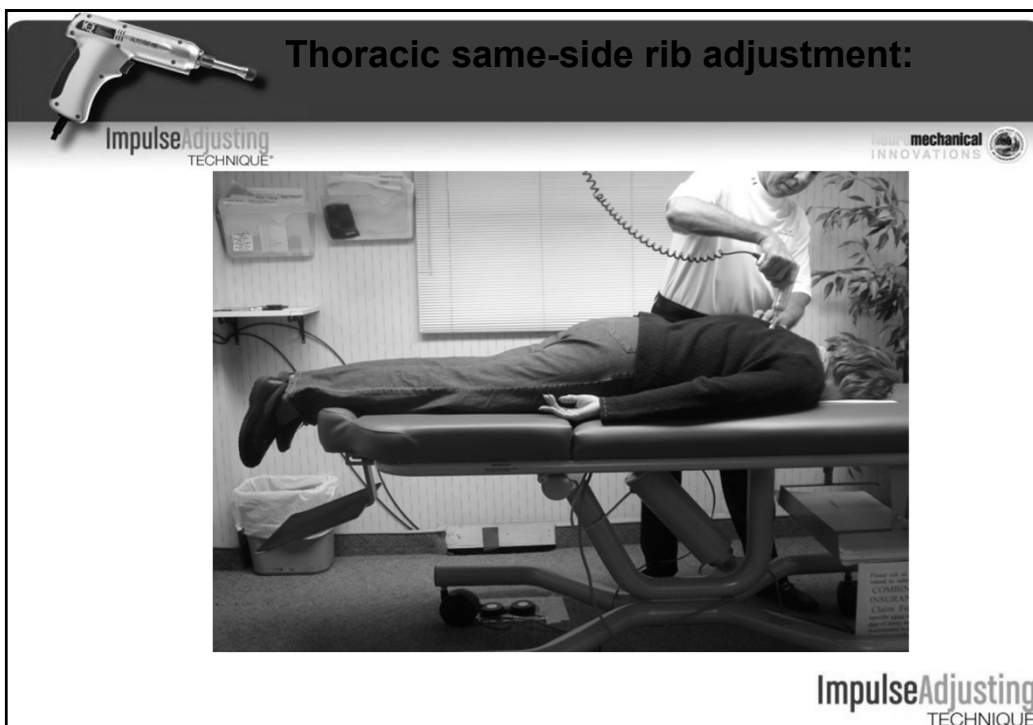
Thoracic TP adjustment:



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“Thoracic costotransverse joint pain patterns: a study in normal volunteers,” Young et al, *BMC Musculoskeletal Disorders*, 2008:9

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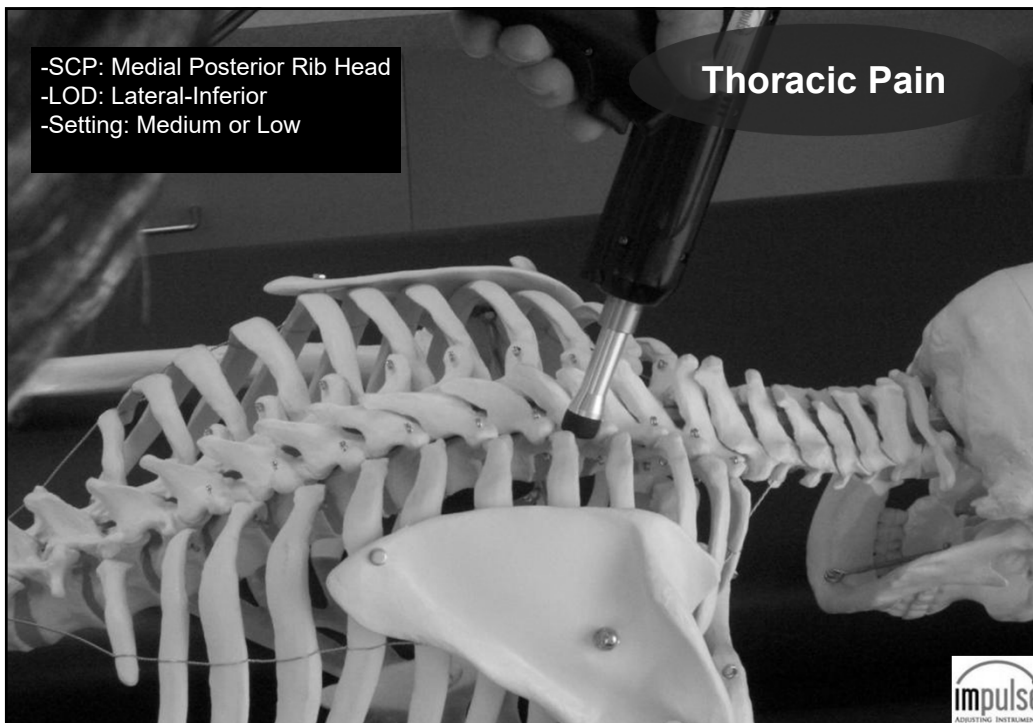
Intra-articular injections in 21 CT joints of 8 pain-free volunteers produced:

A deep dull ache, and pressure sensation.

Pain patterns were superficial to the injected joint.

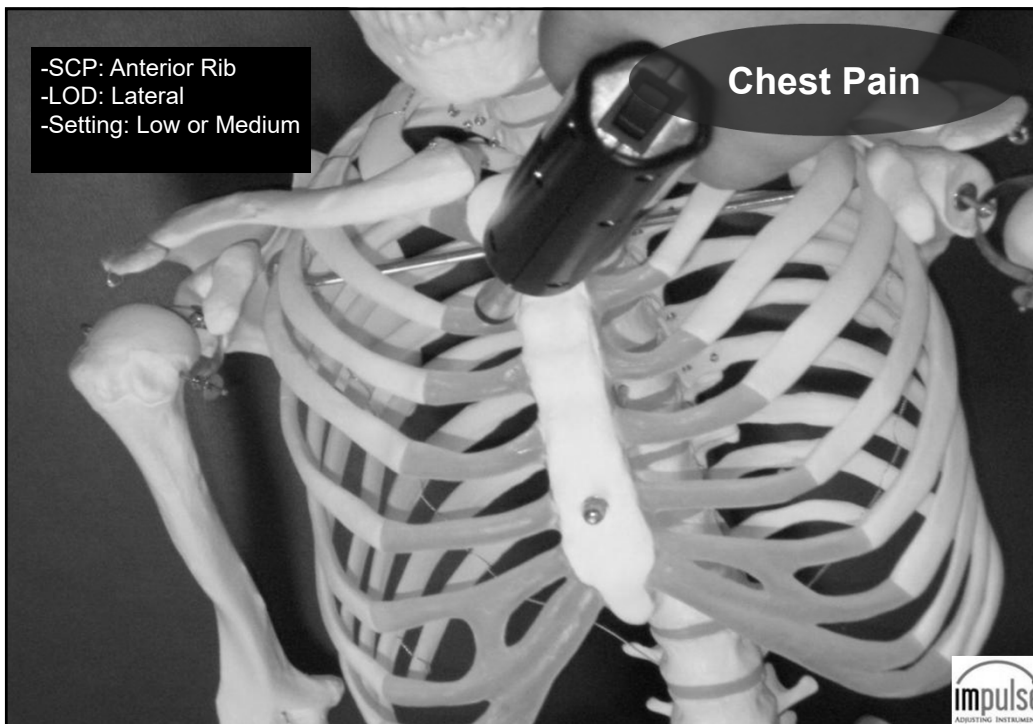
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