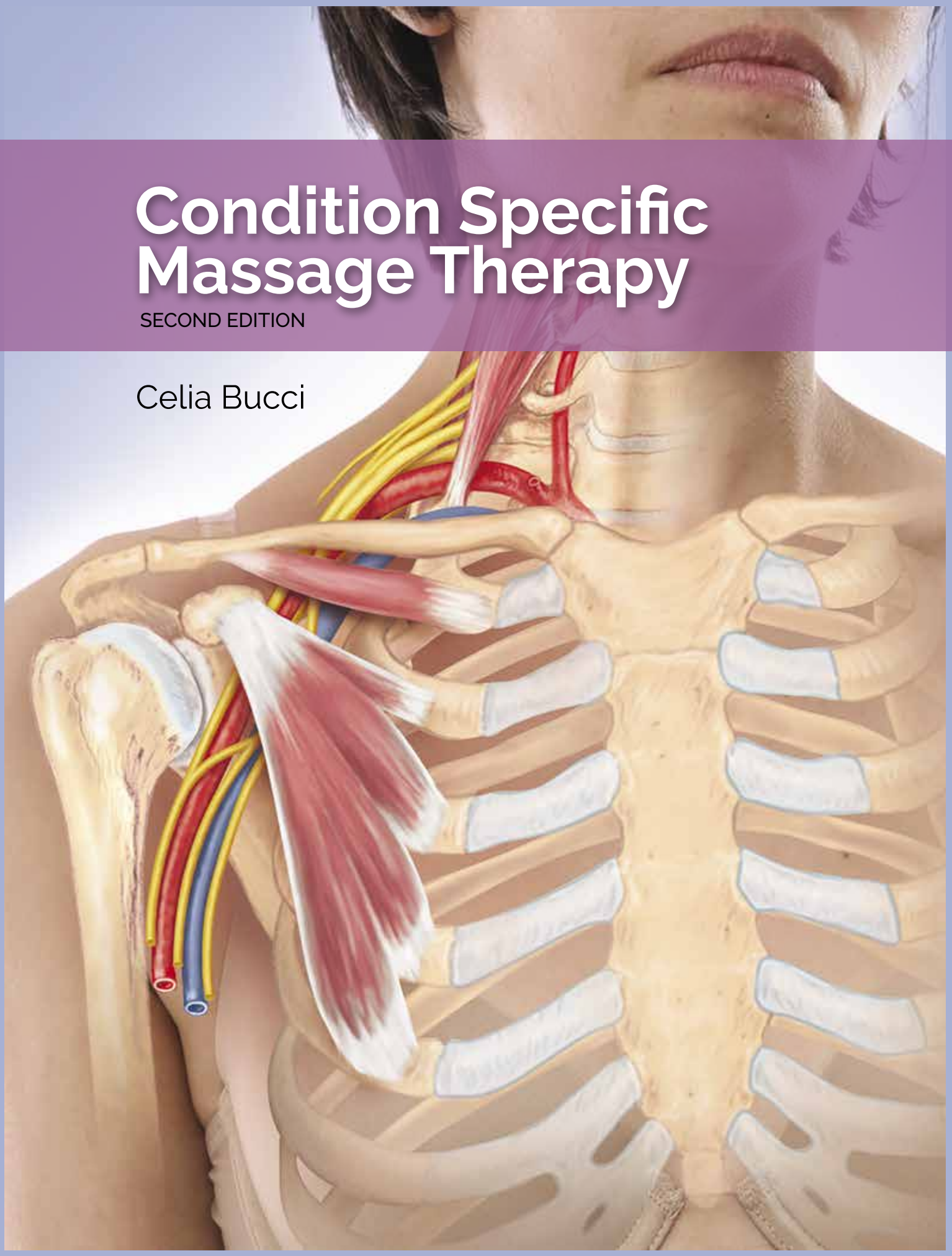
Condition Specific Massage Therapy

SECOND EDITION

Celia Bucci



Chapter 5:

Tension Headaches

Tension Headaches

Understanding Tension Headaches

Headaches can indicate a wide variety of changes in a person's health. They may result from an injury, occur as a symptom of a systemic condition, or may be a condition in themselves. The International Headache Society classifies headaches as primary headaches, secondary headaches, and cranial neuralgias or other headaches. Tension headaches, migraines, and cluster headaches are commonly categorized as primary headaches; this means that the headache is the pathology itself (Fig. 1). Headaches that are caused by underlying pathologies (e.g., sinus headaches) are considered secondary headaches. It is essential to understand the client's health history and to refer the client to a health care provider for diagnosis if you suspect an underlying condition or other contraindications before treating chronic headaches as if the cause is muscle tension. While massage therapy may help relieve symptoms and reduce the occurrence of some secondary headaches, it is not a cure for an underlying condition, and caution should be taken when treating these clients. However, if no other conditions are present, reducing hypertonicity, trigger points, and blood pressure with regularly scheduled massage therapy can decrease the severity and frequency of chronic tension headaches.

Tension headaches are the most common type of headache. Evidence suggests that they may be caused by muscle tension and trigger points, primarily in the shoulders, neck, and head. They respond well to treatments such as over-the-counter pain relievers and manual therapies such as massage. Tension headaches often disrupt the client's activities of daily living, but they are rarely dangerous. Tension headaches are different from migraines, which are believed to have origins that vary but are commonly associated with vascular constriction or a condition of the central nervous system. However, muscle tension often accompanies migraines, and studies have shown that massage can reduce the intensity and frequency of episodes.

Figure 5-1 Types of primary headaches. The client's pattern of pain may help you understand what type of headache they are experiencing.
Image Credit: Africa Studio/Shutterstock

COMMON SIGNS AND SYMPTOMS

Tension headaches are often bilateral but may be unilateral and specific to the referral pattern of one or more trigger points. The pain is dull and aching and is often described as feeling like the pressure of a band or vice around the head or a heavy cape over the head and shoulders. Unlike people with migraines, sufferers of tension headaches do not commonly experience aura, nausea, or vomiting, and physical activity does not usually intensify a tension headache.

In addition to aching in the head, clients sometimes feel pain in the neck or shoulders or between the scapulae. These symptoms may even precede headaches. If the client has hyperkyphosis or hyperlordosis, the common pain patterns that accompany these conditions may also be present. Hypertonicity and trigger points are frequently found in the cervical extensors, particularly the upper trapezius, splenius cervicis, splenius capitis, and the suboccipitals; in cervical flexors including the scalenes and SCM; and in the muscles of mastication. Satellite trigger points may be found in the referral patterns of primary trigger points. The muscles of respiration may also be involved, particularly with hyperkyphosis or chronic respiratory conditions. Clients who suffer from tension headaches may also experience tenderness in the scalp, loss of appetite, fatigue, insomnia, mood changes, and problems with concentration.

Chronic tension headaches are likely to arise in adolescence or young adulthood. This may occur because young adults must become more self-sufficient, which can be stressful, and because activities of daily living often become more sedentary, which affects postural changes that may contribute to muscle tension. Tension headaches often last from 30 minutes to several weeks and can come and go or persist without relief. The headache is considered chronic when it occurs two or three times per week over the course of several months. Without treatment, the client may suffer from chronic tension headaches for years. Tension headaches often manifest in the afternoon, when stress and fatigue accumulate and trigger points become active. The client may have difficulty sleeping—a symptom that, if left untreated, may contribute to the cause of tension headaches.

POSSIBLE CAUSES AND CONTRIBUTING FACTORS

To date, there is no consensus about the precise cause(s) of tension headaches or whether the tension said to contribute is actually due to a contraction of the muscles. Tension in the muscles has been noted in sufferers of both tension and migraine headaches. Fluctuations in levels of chemicals including serotonin have also been found in both. While the cause(s) of these fluctuations remain(s) unclear, researchers now believe that the imbalance activates pain pathways to the brain and impedes natural pain suppression. Nevertheless, headaches are often felt in the referral area of a trigger point, and studies have shown that relaxing tense muscles reduces the frequency of both tension and migraine headaches. However, massage is not likely to improve a migraine that is already in progress, and caution should be used when treating a tension headache in progress to avoid pressure and techniques that could intensify symptoms.

Any postural deviation that affects the cervical or thoracic spine can contribute to muscle tension and resulting headaches. The head-forward posture commonly found in hyperkyphosis is often observed. Temporomandibular joint dysfunction, also often found in clients with hyperkyphosis, is likewise a common contributing factor. Torticollis, disc herniations, whiplash, or other unresolved trauma may be involved. Clients whose activities of daily living include maintaining an inactive posture, such as sitting at a desk or sleeping with the neck in extension, may set the muscles at a high resting tone, contributing to the formation or activation of trigger points. Lack of physical activity—the muscle's enemy—can lead to adhesions, to an accumulation of metabolites, and ultimately to active trigger points. Overuse, fatigue, and stress on the muscles can be culprits of hypertonicity and trigger points. Dehydration, which may cause fatigue and confusion, is one of the most common causes of headaches.

Chemical and hormonal changes, side effects of medications, fluctuations in blood pressure, and hunger or low blood sugar can all contribute to headaches. In these cases, the symptoms are often relieved by addressing the cause. The overuse of pain medication can result in a rebound effect, a phenomenon in which the medication (or suddenly stopping the medication) triggers symptoms it used to relieve. This too can be resolved by decreasing, ceasing, or changing the use of medication under the supervision of a health care provider. Depression and anxiety, which are often related to chemical imbalances and can also cause a client to contract the muscles of the neck and jaw, may play a role in tension headaches.

Insufficient sleep or changes in sleep patterns can affect circadian rhythms and the biological functions they regulate. Sleeping in a cold room or sitting for long periods near a source of cold, such as an air conditioning vent, may activate trigger points that may contribute to headaches. Lifestyle choices including the use of or withdrawal from drugs, alcohol, or caffeine; excessive smoking; and overexertion may contribute to the development of chronic headaches. Cold and flu, eyestrain, nasal congestion, and sinus infections may also be contributing factors.

Chronic tension headaches rarely develop after the age of 50. If so, they may be a red flag for a more serious condition, and the client should be referred to their primary health care provider for assessment. In addition, the client should seek medical attention if headaches are severe (thunderclap), get worse, change patterns, or are no longer relieved by pain medication. Similarly, the client should seek emergency medical attention if difficulty speaking, fever, rash, seizures, numbness, or weakness accompanies headache. These signs and symptoms may indicate a stroke, aneurysm, or other serious conditions. Headaches that occur after coughing, straining, or sudden movement may be a symptom of intracranial pressure or pressure on the spinal cord or nerves and should be assessed by a medical professional. If headaches develop following an injury, the client should see a health care provider for medical assessment before receiving a massage. Table 1 lists conditions commonly confused with or contributing to tension headaches.

Table 5-1: **Differentiating Conditions Commonly Confused with or Contributing to Tension Headaches**

CONDITION	TYPICAL SIGNS & SYMPTOMS	TESTING	MASSAGE THERAPY
Migraine	Episodic or chronic Moderate or severe Often unilateral Pulsating or throbbing Aggravated by physical activity Aura, nausea, vomiting, sensitivity to light and sound	Diagnosed by signs and symptoms, familial history, and response to treatment MRI or CT to rule out other causes EEG to exclude seizures	Massage may not be appropriate during a migraine, but may reduce frequency when performed regularly between headaches.
Cluster headaches	Usually unilateral Swelling under or around eye, red eye Excessive tears Sudden headache with sharp, steady pain, often during sleep	Diagnosed by signs and symptoms MRI to rule out other pathologies	Massage may not be appropriate during a cluster headache, but may reduce frequency and severity when performed regularly between headaches.

Table 5-1: Differentiating Conditions Commonly Confused with or Contributing to Tension Headaches (continued)

CONDITION	TYPICAL SIGNS & SYMPTOMS	TESTING	MASSAGE THERAPY
Sinus headache	Pain or pressure at cheeks and brow Tender sinuses Worse when bending forward or lying down Postnasal drip, sore throat, nasal discharge Possible fever, cough, or fatigue Allergic or infectious sinusitis	Diagnosed by signs and symptoms Mucus sample to test for infection CT scan or MRI	Massage is contraindicated if infection or serious underlying pathology is present. Massage is otherwise appropriate within the client's comfort. The face cradle may be uncomfortable.
Brain tumor	Headaches, seizures, decreased sensation or weakness in one part of the body Changes in mental function and personality Clumsiness, tremor Changes in vision, memory, alertness, speech, hearing, or smell Vomiting, fever, or general ill feeling	CT scan MRI EEG Tissue biopsy Cerebrospinal fluid test	Massage is contraindicated until the client is cleared by a health care provider.
Brain aneurysm	Double vision Loss of vision Headaches Eye pain Neck pain When ruptured: Sudden, severe headache Nausea, vomiting Numbness, weakness, or decreased sensation in a body part Vision or speech changes, drooping eyelid(s) Confusion, lethargy, or seizures	CT scan MRI Cerebrospinal fluid test Cerebral angiography EEG	Massage is contraindicated until the client is cleared by a health care provider. Take caution with circulatory techniques.
Stroke or transient ischemic attack	Symptoms are often unilateral, occur suddenly, last a short time, and may occur again Numbness, tingling, weakness, heavy extremities, speech difficulty, vision changes, vertigo, loss of balance or coordination, staggering or falling Facial paralysis Eye pain Confusion	Medical history CBC CT scan MRI Cerebral arteriogram	Massage is contraindicated when symptoms are present. For a client surviving a stroke or transient ischemic attack, massage is indicated if the client is cleared by the attending medical professional. Avoid rigorous circulatory techniques. Massage around the neck is postponed until the client has returned to pre-stroke activities of daily living.

Table 5-1: Differentiating Conditions Commonly Confused with or Contributing to Tension Headaches (continued)

CONDITION	TYPICAL SIGNS & SYMPTOMS	TESTING	MASSAGE THERAPY
Trigeminal neuralgia	Usually unilateral, around the eye, cheek, and lower face Pain triggered by touch or sound Sharp, electric spasms lasting a few seconds or minutes Pain while brushing teeth, chewing, drinking, eating, or shaving	MRI Blood tests Rule out other conditions	Because of sensitivity to touch, massage is contraindicated without permission and guidance from the client regarding what feels good. The face cradle may be too painful. Massage elsewhere is indicated.
Hemicrania continua	Pain on one side of the head, consistent and daily Generally moderate with occasional severe pain Tearing or redness of eye on affected side Nasal congestion Swelling or drooping of eyelid(s)	Idiopathic No definitive test Diagnosed by signs and symptoms and by ruling out other causes of headache	Refer to health care provider for assessment. Clients with symptoms of hemicrania continua are unlikely to tolerate massage until the symptoms are under control.
Meningitis	Fever and chills Nausea and vomiting Severe headache Stiff neck Sensitivity to light Confusion or decreased consciousness Rapid breathing Loss of appetite Agitation	Chest X-ray CT scan Cerebrospinal fluid test	Massage is contraindicated until the condition is resolved. Refer client to a health care provider.
Encephalitis	Fever Headache Stiff neck, muscle weakness, or paralysis Vomiting Light sensitivity Confusion, drowsiness, or clumsiness Irritability Seizure, loss of consciousness, stupor, or coma	Cerebrospinal fluid test EEG MRI CT scan	Massage therapy is contraindicated until the condition is resolved. Refer client to a health care provider.

Table 5-1: **Differentiating Conditions Commonly Confused with or Contributing to Tension Headaches (continued)**

CONDITION	TYPICAL SIGNS & SYMPTOMS	TESTING	MASSAGE THERAPY
Temporal arteritis	Usually occurs in patients over age 50 Unilateral throbbing Tenderness in scalp Fever, loss of appetite, sweating, weight loss Muscle aches, weakness, and fatigue Reduced, blurred, or double vision Jaw pain	Palpation of scalp for tenderness Weak or no pulse in affected artery Blood tests Liver function tests Biopsy of temporal artery	Refer a client over age 50 with newly developed chronic headaches to a health care provider.
Paget's disease	Persistent bone pain Joint pain and stiffness Headache, neck pain Bowed legs Locally hot to touch Fractures Hearing loss Loss of height	X-ray Bone scan Blood test for serum alkaline phosphatase and serum calcium	Work with health care provider. Massage may help maintain flexibility. Use caution if bones are fragile.
Nerve root compression (radiculopathy)	Muscle spasm, weakness, or atrophy Pain around the scapula on the affected side Neck pain Pain radiates to the extremities Pain worsens with lateral flexion or rotation or when sneezing, coughing, laughing, or straining	Spurling's test Valsalva's test Neurological exam to test reflexes, sensation, and strength	Massage is indicated if cause and location are understood. Take care not to increase compression or reproduce symptoms.

CONTRAINDICATIONS AND SPECIAL CONSIDERATIONS

- **Headache on the day of treatment.** If the client presents with a headache on the day of treatment, do not work aggressively. Although massage is not contraindicated during a tension headache, you should take care not to aggravate the client's symptoms. Myofascial release, lymphatic drainage, and gentle, superficial strokes are most appropriate. The client may not tolerate the face cradle and may be disturbed by light, scents, or sound. You may also consider a shorter treatment or rescheduling the client. If the client's headache frequently occurs in the late afternoon, consider scheduling on a weekend morning when trigger points may not be activated.
- **Underlying pathologies.** Headaches can be a symptom of a wide variety of underlying conditions. If you suspect any condition (consult Table 5-1 and your pathology book for signs and symptoms), refer the client to their health care provider for diagnosis before initiating treatment. If the client is diagnosed with an underlying pathology that is not contraindicated for massage, work with the health

care provider to develop a treatment plan. A client who has newly developed chronic headaches after age 50 should be referred to their health care provider.

- **Endangerment sites.** Be cautious near the endangerment sites in the neck. Gently palpate for the pulse of the carotid artery before you begin working. Avoid this area, and if you feel a pulse while working, back off slowly.
- **Treatment duration and pressure.** If the client is elderly, has degenerative bone disease, or has a condition that diminishes their activities of daily living, you may need to adjust your pressure as well as the treatment duration. Frequent half-hour sessions may suit the client better.
- **Positioning.** Use bolsters to position a client for comfort as well as to correct postures that may contribute to headaches. If the head-forward posture or extension of the neck is evident, using a small bolster under the occiput in the supine position and adjusting the face cradle to reduce the extension of the neck in the prone position may help. If hyperkyphosis is present, bolsters under the shoulders in the prone position will reduce protraction of the scapulae. In the supine position, a bolster along the length of the spine including the occiput reduces protraction of the scapulae and extension of the neck.
- **Hydrotherapy.** Do not use moist heat on the neck or chest if the client has a cardiovascular condition that may be affected by the dilation of blood vessels. Severe hypertension and atherosclerosis are two examples of conditions that are contraindicated for massage. Consult your pathology book for recommendations.
- **Friction.** Do not use deep frictions if the client has a systemic inflammatory condition such as rheumatoid arthritis or osteoarthritis, if the health of the underlying tissues is compromised, or if the client is taking anti-inflammatory medication. Friction creates the inflammatory process, which may interfere with the intended action of anti-inflammatory medication. Recommend that your client refrain from taking such medication for several hours before treatment if their health care provider agrees.
- **Tissue length.** It is important when treating myofascial tissues to not stretch already over-stretched tissues. Assess for myofascial restrictions first and only treat those that are clearly present. Likewise, overstretched muscles should not be stretched from origin to insertion. If you treat trigger points, use heat or a localized pin and stretch technique to lengthen that area.
- **Hypermobile joints and unstable ligaments.** Be cautious with mobilizations if the client has hypermobile joints or if ligaments are unstable due to injury, pregnancy or a systemic condition.

MASSAGE THERAPY RESEARCH

In 2002, Quinn et al. published a study titled “Massage Therapy and Frequency of Chronic Tension Headaches.” The study involved four nonsmoking adults between the ages of 18 and 55 who had experienced headaches two to three times per week in the prior 6 months; these were diagnosed as chronic or episodic tension headaches according to the International Headache Society guidelines. Baseline headache measures were recorded for 4 weeks, followed by 30-minute massages twice per week for 4 weeks. The treatment plan was very specific and was followed precisely for each participant. Participants were asked to keep a headache diary noting frequency, intensity, and duration of each headache. Compared with baseline headache measures, the frequency of headaches was reduced as early as the first week of treatment, and the frequency reduction was maintained for the duration of the study. Pain was also reduced, although it is not sufficiently clear if the massage techniques, stretching, or relaxation techniques included in the treatment had a more or less direct effect on pain reduction. The duration of headaches became shorter for all four participants, and intensity diminished in three participants. On four occasions, participants arrived for

treatment with a headache that was relieved during the 30-minute treatment. In addition, the authors noted that in most sessions, the participants felt headache symptoms when identified trigger points were palpated deeply even when they had not felt the pain prior to palpation; this suggests that the activation of common trigger points may have a strong connection to tension headaches. Although the results are encouraging, a more substantial study with a control group is needed.

In 1990, Puustjärvi et al. published a study titled "The Effects of Massage in Patients with Chronic Tension Headache." The study involved 21 female patients from 21 to 44 years of age who had experienced chronic neck and head pain. Cervical ROM, surface electromyography (EMG) of the upper trapezius and frontalis muscles, pain quality and intensity, and incidence of pain were recorded for 2 weeks before and 2 weeks after treatment, and again at 3 and 6 months during the follow-up period. Each participant received 10 1-hour massage treatments to the upper body over a period of 2.5 weeks and had no other form of therapy during the study. Compared to the initial recordings, the ROM increased in flexion, lateral flexion, and rotation. EMG improvements were noted in the frontalis muscle alone. Pain decreased significantly, and the number of pain-free days doubled. The participants' psychological state was improved immediately following the 2.5 week treatment period, and the improvement continued at the 3- and 6-month follow-ups. Although the evidence is encouraging, this study is not fully reliable because it did not include a control group, and the treatments were not standardized.

In addition, the 1998 study by Hernández-Reif et al. titled "Migraine Headaches Are Reduced by Massage Therapy" and the 2007 case study by Eisensmith titled "Massage Therapy Decreases Frequency and Intensity of Symptoms Related to Temporomandibular Joint Syndrome in One Case Study" suggest that massage therapy may be effective for both migraine headaches and temporomandibular joint syndrome.

Working With the Client

CLIENT ASSESSMENT

Assessment begins at your first contact with a client. In some cases, this may be on the telephone when an appointment is requested. Ask in advance if the client is seeking treatment for a specific area of pain so that you can prepare yourself. Headaches are a common symptom of a wide variety of conditions. It is essential for your assessment to be thorough. If you suspect an underlying condition that requires medical attention, refer the client to their health care provider for assessment. If the client is diagnosed with an underlying condition, research the contraindications or special considerations for the condition. During your assessment, ask questions that will help you differentiate the possible causes of headaches.

Postural Assessment

Allow the client to enter the room ahead of you while you observe their posture and movements. Look for imbalances or patterns of compensation due to pain or weakness. In the absence of a clear cause of tension headaches, such as whiplash or other injury, hyperkyphosis is often a contributing factor. Look for a head-forward posture, neck extension or rotation, elevated shoulders, and slouching. Notice if the client is able to turn the head without involving the shoulders or thoracic spine. This may indicate reduced ROM in the cervical spine. You may also notice hyperlordosis, scoliosis, rotation, or elevation in the hips or pes planus. Figure 2 compares the anatomic position to posture affected by hyperkyphosis with the head forward, a common contributing factor to tension headaches.

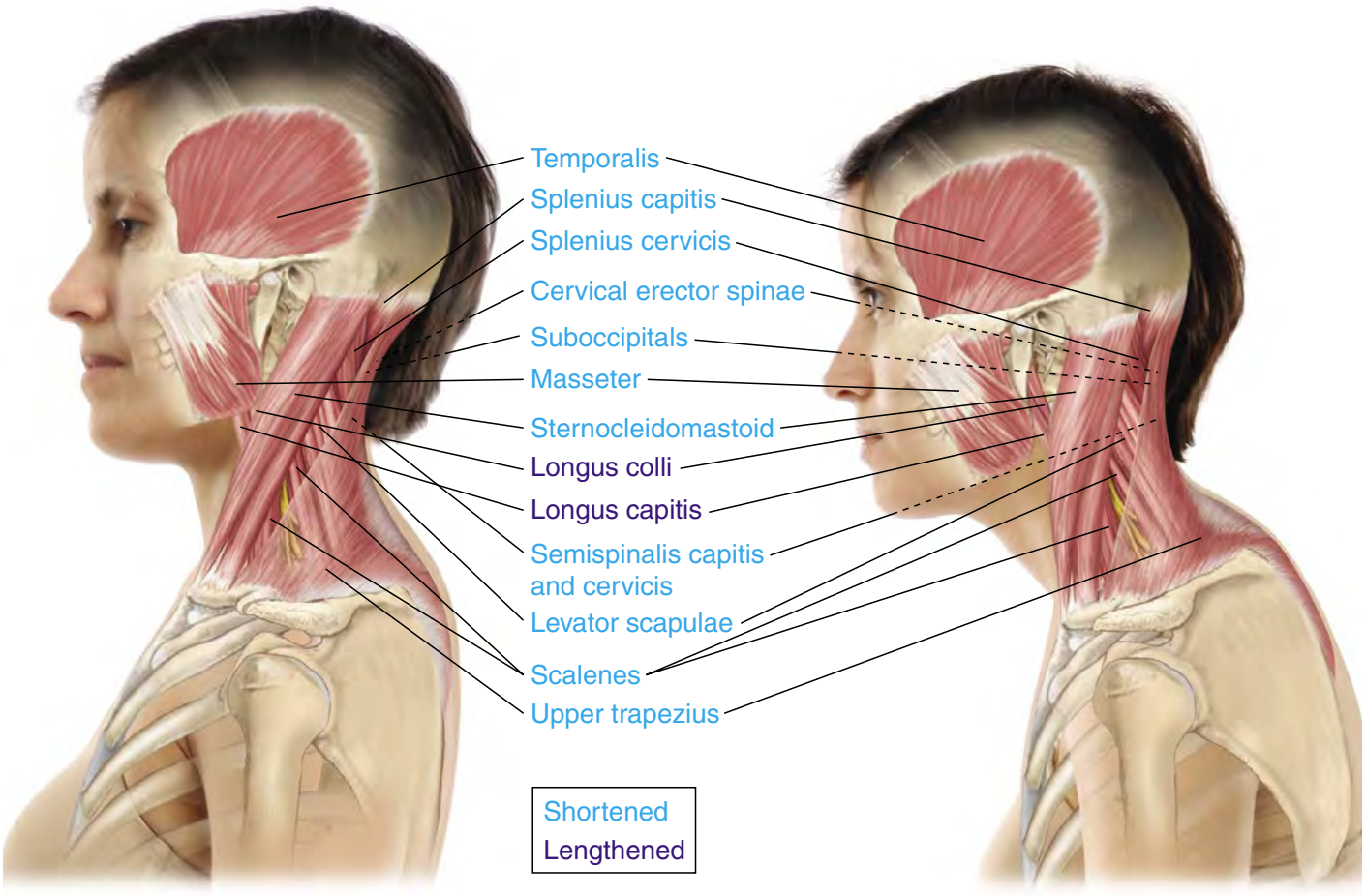


Figure 5-2 Notice how the muscles of the upper cross react to the increased kyphotic curve and head-forward posture, which may contribute to chronic tension headaches.

Table 5-2: **Health History**

QUESTIONS FOR THE CLIENT	IMPORTANCE FOR THE TREATMENT PLAN
Do you have a headache now?	Treatment may need to be adjusted to avoid aggravating symptoms. The client may wish to reschedule.
When did you begin experiencing headaches? Have you experienced any other new symptoms coincident with the onset of headaches?	Newly developed chronic headaches, especially when accompanied by other symptoms, may be a sign of an underlying pathology.
How frequently do you get headaches? Do they occur at or near the same time of day or following similar activities?	Differentiate between episodic or chronic tension headaches. Trigger points are often activated in the late afternoon.
Have you seen a health care provider about your headaches? What was the diagnosis? What tests were performed?	A wide variety of conditions cause headache as a symptom. Infection, acute injury, or an underlying pathology may contraindicate massage. Refer the client to their primary health care provider if you suspect an underlying condition.
Was there any change in your activities of daily living before you developed headaches?	This helps determine potential contributing factors.

Table 5-2: **Health History (continued)**

QUESTIONS FOR THE CLIENT	IMPORTANCE FOR THE TREATMENT PLAN
Where do you feel symptoms?	The location of symptoms gives clues to the location of trigger points, injury, or other contributing factors. Tension headaches often follow the referral area of one or more trigger points.
Describe the character of your symptoms.	This helps to differentiate the possible origins of symptoms. Tension headaches often feel like a band or vise around the head or neck. The character of pain is less likely to be throbbing, pulsating, or sharp.
Do any movements make it worse or better?	Locate tension, weakness, or compression in structures involved in such movements. Tension headaches are not commonly made worse with general activity, although the specific movement of a joint crossed by a muscle containing a trigger point may produce or increase symptoms.
What type of work, hobbies, or other regular activities do you do?	Repetitive motions and static postures that increase neck extension, head-forward posture, or pressure on the mandible may contribute to headaches.
Are you taking any prescribed medication or herbal or other supplements?	Side effects of medications of all types may contribute to symptoms, have contraindications, or require special considerations in treatment.
Have you had a cortisone shot in the past 2 weeks? Where?	Local massage is contraindicated.
Have you taken a pain reliever or muscle relaxant within the past 4 hours?	The client may not be able to judge your pressure.
Have you taken anti-inflammatory medication within the past 4 hours?	Deep friction may cause inflammation and should not be performed if the client has recently taken anti-inflammatory medication.

ROM Assessment

Test the ROM of the neck, shoulders, and thoracic spine, assessing the length and strength of both agonists and antagonists that cross the joints tested. Since it allows the client to control the amount of movement and stay within a pain-free range, only active ROM should be used in the acute stage of injury to prevent undue pain or re-injury. Box 1 presents the average active ROM results for the joints involved in tension headache.

Active ROM

Compare your assessment of the client's active ROM to the values in Box 1. Pain and other symptoms may not be reproduced with active ROM assessment because the client may limit their movement to the symptom-free range.

- **Active extension of the thoracic spine** may be reduced when muscle tension, adhesions, and trigger points are the cause of tension headaches. The client may be resistant to full active extension of the thoracic spine if this produces symptoms during activities of daily living.
- **Active flexion of the cervical spine** in the full range may be restricted due to weakened cervical flexors attempting movement against shortened upper cervical extensors.
- **Active rotation and lateral flexion** of the cervical spine may be reduced or cause pain due to hypertonicity or spasm in the muscles responsible for rotation or lateral flexion, or weak antagonists.
- **Active mobility of the mandible** may be reduced in any direction when the muscles of mastication are hypertonic or contain trigger points.

Box 5-1: Average Active ROM for Joints Involved in Tension Headaches

Cervical Spine

Flexion 60˚
- SCM (bilateral)
- Anterior scalenes (bilateral)
- Longus capitis (bilateral)
- Longus colli (bilateral)

Extension 55˚
- Upper trapezius (bilateral)
- Levator scapulae (bilateral)
- Splenius capitis (bilateral)
- Splenius cervicis (bilateral)
- Rectus capitis (bilateral)
- Oblique capitis superior (bilateral)
- Semispinalis capitis (bilateral)
- Longissimus capitis (bilateral)
- Longissimus cervicis (bilateral)
- Iliocostalis cervicis (bilateral)

Lateral Flexion 20–45˚
- Upper trapezius (unilateral)
- Levator scapulae (unilateral)
- Splenius capitis (unilateral)
- Splenius cervicis (unilateral)
- SCM (unilateral)
- Longus capitis (unilateral)
- Longus colli (unilateral)
- Anterior scalene (unilateral)
- Middle scalene (unilateral)
- Posterior scalene (unilateral)
- Longissimus capitis (unilateral)
- Longissimus cervicis (unilateral)
- Iliocostalis cervicis (unilateral)

Cervical Spine continued

Ipsilateral Rotation 70–90˚
- Levator scapulae (unilateral)
- Splenius capitis (unilateral)
- Splenius cervicis (unilateral)
- Rectus capitis (unilateral)
- Obliquus capitis (unilateral)
- Longus colli (unilateral)
- Longus capitis (unilateral)
- Longissimus capitis (unilateral)
- Longissimus cervicis (unilateral)
- Iliocostalis cervicis (unilateral)

Contralateral Rotation 70–90˚
- Upper trapezius (unilateral)
- SCM (unilateral)
- Anterior scalene (unilateral)
- Middle scalene (unilateral)
- Posterior scalene (unilateral)

Thoracic Spine

Extension 20–30˚
- Spinalis
- Longissimus
- Iliocostalis
- Multifidi
- Rotatores
- Semispinalis capitis
- Latissimus dorsi

Mandible

Elevation (contact of teeth)
- Masseter
- Temporalis
- Medial pterygoid

Depression 35–50 mm
- Suprahyoid
- Infrahyoid
- Digastric
- Platysma

Protraction 3–7 mm
- Lateral pterygoid
- Medial pterygoid

Retraction
- Temporalis
- Digastric

Contralateral Lateral Deviation 5–12 mm
- Lateral pterygoid
- Medial pterygoid

Passive ROM

Compare the client's P ROM on one side to the other when applicable. Notice and compare the end feel for each range.

- **Passive flexion of the cervical spine** may be restricted due to shortened cervical extensors.
- **Passive lateral flexion or rotation of the cervical spine** may be restricted unilaterally if the client's posture favors lateral flexion or rotation to the opposite side.
- **Passive extension of the cervical spine** will likely occur with ease but may produce pain at the end point.

Resisted ROM

Use resisted tests to assess the strength of the muscles that cross the joints involved. Compare the strength of the affected side to the unaffected side.

- **Resisted flexion of the neck** may reveal weakness in the anterior neck muscles.
- **Resisted rotation or lateral flexion of the neck** may produce or refer pain if the muscles responsible for that action are tight or contain trigger points, and may reveal weakness in their antagonists.

Figure 5-3 Vertebral artery test.

Figure 5-4 Spurling's test.

SPECIAL TESTS

The following special tests will help you determine when a client should be evaluated by a health care provider using X-ray or other tools, which may reveal conditions that are contraindicated or require special considerations when planning treatment with massage.

The **vertebral artery test** may reveal insufficiency in the vertebral artery and is performed if the client states that they experience vertigo, blurred vision, or light-headedness during activities of daily living (Fig. 3).

1. Position the client seated in a chair facing you with the eyes open.
2. Instruct the client to fully rotate and extend the neck to one side for 30 seconds.
3. If, during this time, the client complains of nausea or dizziness or if you notice involuntary motion of the eyes, the test is positive for insufficient circulation through the vertebral artery, and the client should be referred to their health care provider.
4. If the test is negative on one side, test the other. Do not test the other side if the first side tests positive.

Spurling's test may reveal compression of a nerve or irritation to the facet joint in the cervical spine and is performed when the client has had an injury, complains of pain that radiates, or experiences numbness and tingling in the arm. Although massage may not be contraindicated for a client with these conditions, refer the client to a health care provider for more detailed information or a massage therapist with advanced training in treating difficult cases. If the client tested positive for vertebral artery insufficiency, do not perform Spurling's test.

1. If the client has recurring symptoms on one side only, begin with that side.
2. Stand behind the seated client and instruct them to extend, laterally flex, and rotate the head to the affected side.

3. Gently and slowly press down on the client's head (Fig. 4). If the client cannot extend, laterally flex, or rotate the neck, perform a simple compression test without these actions.
4. If the client experiences radiating pain, numbness, or tingling in the arm, the test is positive for nerve root compression.
5. Ask the client to describe the location of symptoms because this may suggest which nerve is compressed.
6. If the client feels pain that does not move past the neck, the test is positive for irritation of the facet joint.
7. Applying gentle traction to the neck after the test may relieve symptoms. If traction does relieve symptoms, this is considered reinforcement that Spurling's test was positive for compression of a nerve or facet joint irritation.

Palpation Assessment

Muscles that commonly contribute to tension headaches attach at the occiput, mastoid process, ligamentum nuchae, the cervical vertebrae, the upper thoracic vertebrae, and the scapulae. Palpate these areas for tenderness. Carefully palpating the many muscles attached to those bones will give you the most complete picture. The muscles most commonly involved in tension headaches include the trapezius, scalenes, SCM, splenius capitis and cervicis, semispinalis capitis and cervicis, the cervical erector spinae, levator scapulae, and suboccipitals. Palpate these for hyper- or hypotonicity and trigger points.

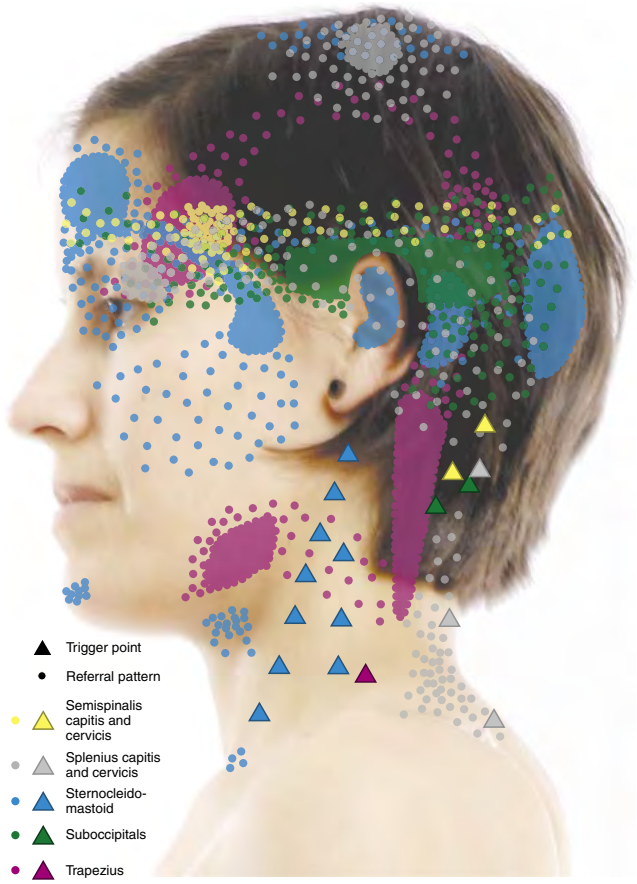
The muscles of mastication and respiration may also be hypertonic and tender, especially if hyperkyphosis, the head-forward posture, temporomandibular joint dysfunction, or a respiratory disorder is present. Palpate the temporalis, masseter, and pterygoids to assess their involvement. The intercostals and diaphragm may be tender or hypertonic. The occipitofrontalis, which includes the occipitalis, frontalis, and galea aponeurotica between them, may be tender.

CONDITION SPECIFIC MASSAGE

Because headaches may be a secondary condition or may have a structural cause, it is important to know the health history of the client. If a systemic condition or degenerative bone or disc disease is present, it is advisable to first discuss treatment with the client's health care provider and to adjust accordingly. Temporomandibular joint dysfunction is another condition that may contribute to tension headaches. Temporomandibular joint dysfunction is not covered in this text, but you may treat the muscles of mastication generally to offer some relief, study this condition in greater detail elsewhere, or refer the client to a massage therapist with training in this area.

It is essential for treatment to be relaxing. You are not likely to eradicate the pain associated with chronic tension headaches, or any of the conditions associated with it, in one treatment. Do not try to do so by treating aggressively. Be sure to ask your client to let you know if the amount of pressure keeps them from relaxing. If the client responds by tensing muscles or has a facial expression that looks distressed, reduce your pressure. Remember that you are working on tissue that is compromised.

Ask the client to let you know if any part of your treatment reproduces symptoms. If deep palpation of a trigger point reproduces symptoms, explain this to your client and ask them to breathe deeply during the technique. As the trigger point is deactivated, the referral pain will also diminish. Muscles with trigger points that refer pain into the head include the trapezius, SCM, masseter, temporalis, medial and lateral pterygoid,



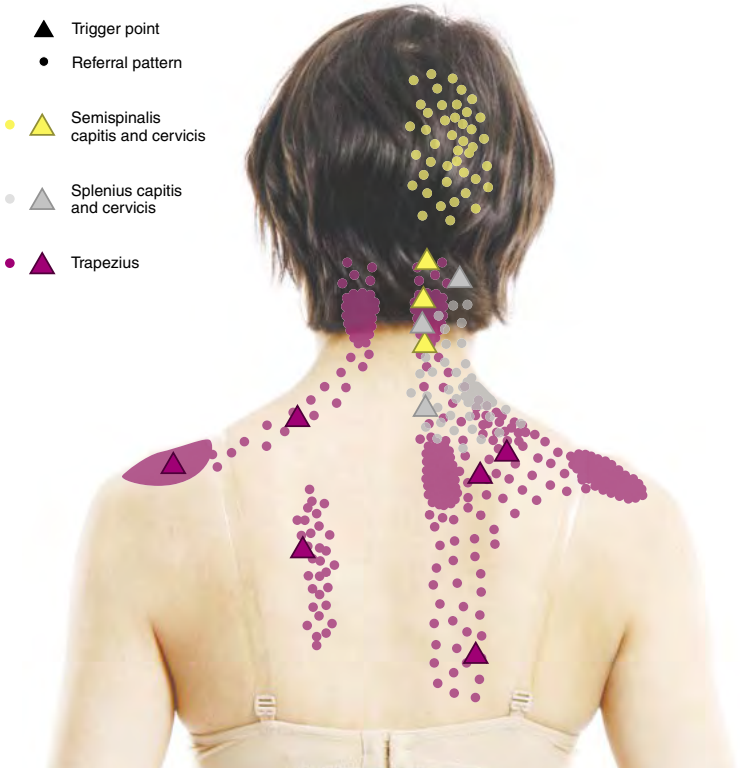


Figure 5-5 Common trigger points and referral patterns associated with tension headaches.

suboccipitals, semispinalis capitis and cervicis, and splenius capitis and cervicis. Common trigger points that refer pain into the head are shown in Figure 5.

If any other reproduction of symptoms occurs, adjust the client to a more neutral position, reduce your pressure, or move slightly off the area, and make a note about it, as it may help you understand more clearly exactly which neuromuscular conditions are contributing to the client's symptoms. Instruct your client to use deep but relaxing breathing to encourage calming.

The following suggestions are for the treatment of tension headaches. You may not need a full hour to treat the muscles commonly involved in tension headaches, and overtreating may reproduce symptoms. Treating too many trigger points in one session may increase pain. If time remains, address any other postural deviations or contributing factors you may find in your assessment.

Treatment Goals:

 Increase circulation
 Reduce adhesions
 Reduce tone/ tension
 Lengthen tissue
 Treat trigger points
 Passive stretch
 Clear area

- If light affects the client's condition, cover their eyes with an eye pillow or pillowcase. Ask the client if scents or sounds are disturbing, and adjust accordingly. If hyperkyphosis is present, use a rolled towel or other bolster along the length of the spine in the supine position. If the client's neck is in extension, fold a pillowcase or hand towel into a small bolster, and place it under the occiput without obstructing your access to the posterior neck muscles.

- If it is comfortable for the client, place moist heat on the neck and shoulder muscles.
- If shortened pectorals or hyperkyphosis is a factor, treat this area fully. If the pectorals are not involved, treat the area superficially to relax the client, and open the channels of circulation in the thorax.

- Assess the tissues of the lateral neck for myofascial restrictions. These may be found near the mastoid process and along the lateral neck toward the acromion process and lateral clavicle. Reduce adhesions if indicated.

- Assess and treat tissues from the cervical vertebrae to the acromion process to reduce adhesions in the upper trapezius and to begin assessing for taut bands in the cervical muscles. Treat tissues from the cervical vertebrae toward the superior angle of the scapulae to assess and treat the levator scapulae.

- Assess and reduce tension at the attachment sites of all posterior cervical muscles including the acromion process, clavicle, and spine of the scapulae. Follow with the same technique along the transverse and spinous processes of the upper thoracic, all cervical vertebrae, and the occiput.

- Assess the SCM, suboccipitals, semispinalis capitis and cervicis, and splenius capitis and cervicis for taut bands and trigger points, and treat those you find.

- Arrange your four fingers of both hands along the occiput and apply pressure to perform Golgi tendon release along the occiput.

- Thoroughly stretch all muscles that extend and laterally flex the neck.



- Assess and treat the tissues of the anterior neck, in particular the SCM and scalenes. Gently nudge the SCM medially to assess and treat the anterior scalenes. Warm the tissues thoroughly, treat any trigger points found, and follow with a full stretch to the SCM and scalenes.




- Treat the muscles of mastication, including the temporalis, masseter, and pterygoids to reduce tension. Assess for taut bands and treat any trigger points found. Wearing non-powdered or washed gloves, stretch these muscles by gently opening the mouth passively and holding for at least 15 seconds. You can also perform postisometric relaxation techniques by asking the client to close the mouth against your resistance, taking care to instruct the client not to bite down completely, and then releasing the contraction for a full stretch. Intra-oral treatment may be prohibited according to your state regulations.



- Gently treat the rest of the face, particularly around the sinuses. If you suspect sinus pressure to be a contributing factor, spend a bit more time warming and softening the contents of the sinuses by placing your finger at the sinus and using gentle pressure. You may actually feel movement of fluid during this technique. Follow with gentle tapping at the sinuses, asking the client to hum deeply, explaining that the vibration may help to break up congestion. Follow with superficial gliding strokes moving inferiorly to drain the sinuses.

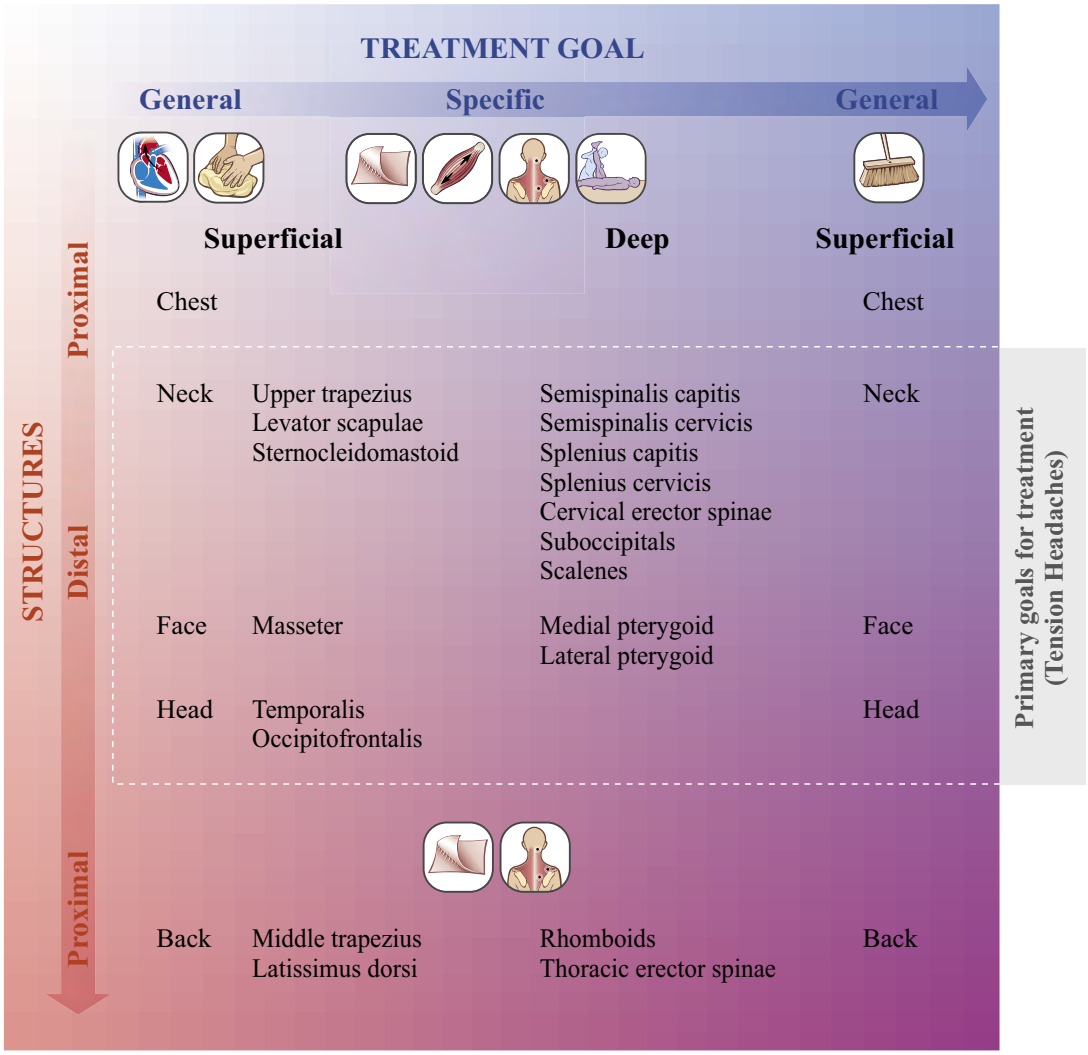


- Treat the full scalp to increase circulation and release tension in the occipitofrontalis. If the client tolerates it, pulling the hair very gently may be useful in increasing circulation and reducing tension in the scalp.
- Apply clearing strokes to the face and head.

- If time permits and the client can tolerate the face cradle in the prone position, treat the posterior thoracic muscles as needed. If hyperkyphosis is involved, you may find overstretched rhomboids, middle trapezius, and thoracic erector spinae and hypertonic cervical erector spinae, lower trapezius, and latissimus dorsi. If a respiratory condition is a factor, be sure to assess and treat the serratus muscles.

CLIENT SELF-CARE

The following are intended as general recommendations for stretching and strengthening muscles involved in tension headaches. The objective is to create distance between the attachment sites of muscles that have shortened and to perform repetitions of movements that decrease the distance between the attachments of muscles that have weakened. If you have had no training in remedial exercises and do not feel that you have a functional understanding of stretching and strengthening, refer the client to a professional with training in this area.



Clients often neglect self-care because their daily lives are busy. Encourage them to follow these guidelines:

- Instruct the client to perform self-care activities throughout the day, such as while taking a phone call, reading e-mail, watching television, or performing other activities of daily living instead of setting aside extra time.
- Encourage the client to take regular breaks from repetitive actions.
- Demonstrate gentle self-massage to keep adhesions and hypertonicity at bay between treatments.
- Encourage the client to perform relaxed, deep breathing exercises when pain arises.
- Encourage the client to keep a headache journal, which may help identify patterns and aggravating factors.
- Instruct the client on proper posture to keep pressure off weakened joints. For the client who spends long hours at a desk or on the telephone, it is essential to demonstrate the proper seated posture and to instruct the client not to hold the phone between the ear and shoulder. Recommend a sleeping position that does not stress the client's affected structures.
- Demonstrate all strengthening exercises and stretches to your client and have them perform these in your presence before leaving to ensure that they are performing them properly and will not harm themselves when practicing alone. Stretches should be held for 15–30 seconds and performed frequently throughout the day within the client's limits. The client should not force the stretch. It should be slow and gentle, trying to keep every other muscle as relaxed as possible.

Figure 5-6 Cervical extensor stretch.

Figure 5-7 Cervical flexor strengthening.

Stretching

To stretch the posterior neck muscles, instruct the client to let the head hang so that the chin approaches the chest (Fig. 6). They should not force the chin to touch the chest with an active contraction. To increase the stretch, the client can rest the hands on the back of the head and allow the weight of the arms to gently pull the chin toward the chest. It may help to gently rotate the flexed neck to one side to more specifically target muscles that need lengthening.

To stretch the cervical rotators and restore mobility, instruct the client to slowly and gently rotate the neck to one side, hold for 5–10 seconds, then rotate to the other side and hold; repeat this 5–10 times or as often as is comfortable before the client feels fatigue or weakness. For some, it may feel good to rotate the head in extension as well, but this is not advised if the client is at risk for nerve compression or herniation. Even in the absence of disc disease or nerve compression, one rotation in extension may be performed after several side-to-side rotations in flexion, but do not instruct the client to do a full repeated circumduction of the head.

If temporomandibular joint dysfunction is a contributing factor, and the joint does not dislocate during movement, instruct the client to open the mouth as widely as is comfortable and to hold for 15 seconds, relax for 5 seconds, and repeat this stretch 5–10 times. If possible, have the client alternate between opening the mouth straight and then opening the mouth with the lower jaw to the right, then to the left, always coming back to the middle between stretches. You may also instruct the client to perform gentle massage to the muscles of mastication.

Strengthening

The client can strengthen the deep anterior neck muscles with resisted flexion of the neck. Instruct the client to rest the forehead in the palm of their hand, and with the spine erect and thorax in proper alignment, flex the neck against the resistance of the hand (Fig. 7). These can be held for approximately 5–10 seconds with 3–5 seconds of rest between each resistance. The client can perform 10 or more repetitions for as long as it is comfortable before feeling fatigue or weakness in the neck.

If hyperkyphosis is a contributing factor, the client must also strengthen the middle trapezius and rhomboids in order to oppose the pull of the shortened pectoral muscles. Instruct the client to stand with the arms comfortably hanging at the sides while squeezing the scapulae together. When this is done properly, only the middle trapezius and rhomboids should contract while the shoulders are relaxed.

SUGGESTIONS FOR FURTHER TREATMENT

Ideally, the client with chronic tension headaches will have treatments once or twice a week until symptoms are absent for at least 7 days. As treatment continues, the period of symptom-free days should increase until headaches become occasional or are relieved completely. After this, the client can schedule as necessary. If the headaches are caused by muscle tension, there should be some improvement with each session. If this is not happening, consider the following possibilities:

- There is too much time between treatments. It is always best to give the newly treated tissues 24–48 hours to adapt, but if too much time passes between treatments in the beginning, the client's activities of daily living may reverse any progress.
- The client is not adjusting their activities of daily living or is not keeping up with self-care. As much as we want to fix the problem, we cannot force a client to make the adjustments we suggest.
- The condition is advanced or involves other musculoskeletal complications that are beyond your basic training. Refer this client to a massage therapist with advanced clinical or medical massage training. Continuing to treat a client whose case is beyond your scope of practice could turn the client away from massage therapy altogether and hinder their healing.
- The headaches have an undiagnosed, underlying cause. Discontinue treatment until the client sees a health care provider for medical assessment.

If you are not treating the client in a clinical setting or private practice, you may not be the therapist who takes this client through the full program of healing. Still, if you can bring some relief, it may encourage the client to discuss this change with a health care provider and to consider massage therapy rather than more aggressive treatment options. If the client agrees to return for regular treatments, the symptoms are likely to change each time, so it is important to perform an assessment before each session. Once you have released superficial tissues in general areas, you may be able to focus more of your treatment on a specific area. Likewise, once you have treated the structures specific to tension headaches, you may be able to pay closer attention to compensating structures and coexisting conditions.

Professional Growth

Case Study

Grace is a 20-year-old college student. She was an athlete in high school and has tried to continue in sports, but her current responsibilities make it difficult for her to stay active. Grace does her best to choose healthy options when she finds the time to eat a proper meal. She rarely has time for exercise, but walks to and from classes, which are approximately a mile away from her home. She has been getting headaches in the late afternoon a few days a week.

SUBJECTIVE

Grace stated having headaches that begin in the late afternoon. The headaches get better while she is walking home but sometimes kick up again after dinner when she does her homework and persist until she goes to sleep or takes an aspirin. She does not wake up with the headache. She has had occasional

headaches at school for a few months, but recently they have become as frequent as 3 or 4 times per week. She feels the pain on the side of her head as if it wraps around her ear. The pain is often on the left side, but occasionally it feels like it fills her whole head. She also stated that recently she noticed that she feels pain on the left side of her upper back when she gets a headache. She stated that her desk at work is set up with the phone and keyboard to the left of her screen, so she often holds the phone with her left shoulder and has to turn her head to the right to look at the screen when typing. When asked to describe the character and intensity of pain, she stated that it felt as if she were wearing a helmet that is too tight, and that the pain was distracting and slowed her down but did not cause her to stop working. On a scale of 1–10, Grace stated that she felt pain at a level 6 most of the time, occasionally at 7 or 8. When asked, Grace was unsure whether she has the tendency to grind her teeth. When asked, she stated that she has had no numbness, tingling, extremes of temperature, or other unusual sensations in the extremities, has felt no dizziness, vertigo, nausea or changes in vision or speech, and has never experienced an aura or sensitivity to light with her headaches. Grace drinks water regularly throughout the day.

OBJECTIVE

When I stood to Grace's right, she was able to look toward me by rotating only her head. When I stood to her left, she rotated her whole thorax to look in my direction. Postural assessment revealed a head-forward posture and an elevated left shoulder. Her head is laterally flexed left and rotated to the right. Her thorax is slightly flexed to the left. Her hips are slightly rotated to the right. Palpation assessment revealed that her superficial neck extensors are adhered and dense. It was difficult to distinguish individual muscles or to feel muscle fibers initially.

ACTION

I began treatment in the supine position with a bolster under the occiput and an eye pillow over the eyes. I performed myofascial release on the superficial adhesions along the occiput toward the mastoid process and down the lateral neck. I spent a significant amount of time warming the lateral and posterior neck with effleurage and cross-fiber friction. I applied muscle stripping to the upper trapezius bilaterally. I found a trigger point approximately 2 inches medial to the left acromion process that referred pain into the head around the ear at a pain level of 8. Compression followed by focused muscle stripping reduced the intensity of the referred pain to level 5. I applied pincer grip petrissage to the SCMs. No trigger points were found. I used cross-fiber friction on the scalenes followed by muscle stripping. I found a trigger point in the left anterior scalene approximately 1 inch superior to the clavicle that referred pain across the left shoulder at level 6. Compression followed by muscle stripping reduced the referred pain to level 2. I applied a deep stretch to the upper trapezius, SCMs, and scalenes bilaterally. I also applied cross-fiber friction to the neck extensors and circular petrissage along the spine of the scapulae, superior angles of the scapulae, and the thoracic and cervical vertebrae. Taut bands were found in the left splenius capitis and levator scapulae. No trigger points were found. I used deep friction on the neck extensors to reduce adhesions and release taut bands. With the remaining time, I paid minor attention to the full length of the erector spinae, latissimus dorsi, internal and external obliques, and quadratus lumborum to assess and begin reducing thoracic flexion and rotation in hips.

Grace stated that she felt less stiff than when she arrived.

PLAN

I demonstrated stretches to the neck extensors and rotators. I recommended that she practice these frequently throughout the day, particularly when she is working or studying. I also recommended that she reorganize her desk so that she can look straight ahead instead of rotating her head toward the screen. I recommended that she use, when possible, a speakerphone or headset or to hold the telephone with her hand instead of using her shoulder. I recommended biweekly treatments for 2 weeks followed by reassessment. This will help to keep adhesions at bay so that we can target more specific tissues in subsequent sessions. Grace scheduled a 1-hour session 4 days from today.

Critical Thinking Exercises

1. Develop a 10-minute stretching and strengthening routine for a client that covers all of the muscles commonly involved in tension headaches. Use Box 5-1 and Figure 5-5 as a guide. Remember that a stretch increases the distance between the origin and insertion of a muscle and is important for those muscles that are shortened, while strengthening is performed by actively bringing the origin and insertion closer together and is important if the antagonists of shortened muscles have weakened. Describe each step of the routine in enough detail that the client can perform it without your assistance.
2. A potential client explains that about 6 months ago she started feeling stiffness and pain in her neck and shoulders. She associates this pain with being pulled and spun abruptly during a tango class. She saw her doctor when the pain persisted for a week but was released with no injuries found. No X-rays or special tests were performed. The doctor recommended chiropractic treatment, and the client complied. No X-rays were taken, but orthopedic tests were negative for a herniated disc. The chiropractor adjusted the cervical and thoracic vertebrae, which brought relief for only a day or two. Three subsequent visits also resulted in only temporary relief. In the past few weeks, the client has been experiencing chronic headaches. Assuming that the abrupt movement while dancing was the primary contributing factor, what injury may have occurred that would result in chronic pain and headaches? What are some things to consider in your assessment of an injury that was only temporarily relieved by chiropractic adjustment to the vertebrae? Which structures will you assess and what abnormalities might you expect to find?
3. Discuss special considerations and adjustments to treatment for a client who has chronic tension headaches as well as a condition such as hypertension or atherosclerosis that is currently under control and being monitored by a health care provider.
4. Conduct a short literature review to explain how the following conditions may put a client at risk for chronic headaches:
   - Nerve root compression
   - Diabetes
   - Chronic bronchitis
   - Dental overbite
   - Whiplash
   - Menopause
   - Depression or anxiety
   - Withdrawal from drugs, alcohol, caffeine, or cigarettes

BIBLIOGRAPHY AND SUGGESTED READINGS

Cibulka MT. Sternocleidomastoid muscle imbalance in a patient with recurrent headache. Manual Therapy. 2006;11(1):78–82.

Eisensmith LP. Massage therapy decreases frequency and intensity of symptoms related to temporomandibular joint syndrome in one case study. Journal of Bodywork and Movement Therapies. 2007;11(3):223–230.

Fernández-de-las-Peñas C, Alonso-Blanco C, Cuadrado ML, et al. Myofascial trigger points in the suboccipital muscles in episodic tension-type headache. Manual Therapy. 2006;11(3):225–230.

Fernández-de-las-PeñAssessing C, Ge H-Y, Arendt-Nielsen L, et al. Referred pain from trapezius muscle trigger points share similar characteristics with chronic tension type headache. European Journal of Pain. 2007;11(4): 475–482.

Giacomini PG, Alessandrini M, Evangelista M, et al. Impaired postural control in patients affected by tension-type headache. European Journal of Pain. 2004;8(6):579–583.

Hernandez-Reif M, Dieter J, Field T, et al. Migraine headaches are reduced by massage therapy. International Journal of Neuroscience. 1998;96:1–11.

International Headache Society. IHS Classification ICHD-II. Available at http://ihs-classification.org/en/. Accessed Summer 2008.

International Headache Society. Available at http://www.i-h-s.org/. Accessed Summer 2008.

Mayo Foundation for Medical Education and Research. Sinus Headaches. Available at http://www. mayoclinic.com/health/sinus-headaches/DS00647. Accessed Summer 2008.

Mayo Foundation for Medical Education and Research. Migraine. Available at http://www.mayoclinic.com/health/migraine-headache/DS00120. Accessed Winter 2010.

Mayo Foundation for Medical Education and Research. Tension Headache. Available at http://www. mayoclinic.com/health/tension-headache/DS00304. Accessed Winter 2010.

Moore MK. Upper crossed syndrome and its relationship to cervicogenic headache. Journal of Manipulative and Physiological Therapeutics. 2004;27(6):414–420.

National Institute of Neurological Disorders and Stroke. Hemicrania Continua Information Page. Available at http://www.ninds.nih.gov/disorders/hemicrania_continua/hemicrania_continua.htm. Accessed Summer 2008.

Oksanen A, Erkintalo M, Metsähonkala L, et al. Neck muscles cross-sectional area in adolescents with and without headache—MRI study. European Journal of Pain. 2008;12(7):952–959.

Puustjärvi K, Airaksinen O, Pöntinen PJ. The effects of massage in patients with chronic tension headache. Acupuncture & Electro-Therapeutics Research; The International Journal. 1990;15(2): 159–162.

Quinn C, Chandler C, Moraska A. Massage therapy and frequency of chronic tension headaches. American Journal of Public Health. 2002;92(10):1657–1661.

Rattray F, Ludwig L. *Clinical Massage Therapy: Understanding, Assessing and Treating over 70 Conditions*. Toronto ON:, Talus Incorporated, 2000.

Simons DG, Travell JG, Simons LS. *Myofascial Pain and Dysfunction: The Trigger Point Manual*, 2nd ed. Philadelphia, PA: Lippincott Williams & Wilkins, 1999.

Turchaninov R. Medical Massage, 2nd ed. Phoenix, AZ: Aesculapius Books, 2006.

U.S. National Library of Medicine and the National Institutes of Health. Encephalitis. Available at http://www.nlm.nih.gov/medlineplus/ency/article/001415.htm. Accessed Summer 2008.

U.S. National Library of Medicine and the National Institutes of Health. Meningitis. Available at http://www.nlm.nih.gov/medlineplus/ency/article/000680.htm. Accessed Summer 2008.

U.S. National Library of Medicine and the National Institutes of Health. Migraine. Available at http://www.nlm.nih.gov/medlineplus/ency/article/000709.htm. Accessed Summer 2008.

U.S. National Library of Medicine and the National Institutes of Health. Stroke. Available at http://www.nlm.nih.gov/medlineplus/ency/article/000726.htm. Accessed Summer 2008.

U.S. National Library of Medicine and the National Institutes of Health. Temporal Arteritis. Available at http://www.nlm.nih.gov/medlineplus/ency/article/000448.htm. Accessed Summer 2008.

U.S. National Library of Medicine and the National Institutes of Health. Tension Headache. Available at http://www.nlm.

nih.gov/medlineplus/ency/article/000797.htm. Accessed Summer 2008.

U.S. National Library of Medicine and the National Institutes of Health. Trigeminal Neuralgia. Available at http://www.nlm.nih.gov/medlineplus/ency/article/000742.htm. Accessed Summer 2008.

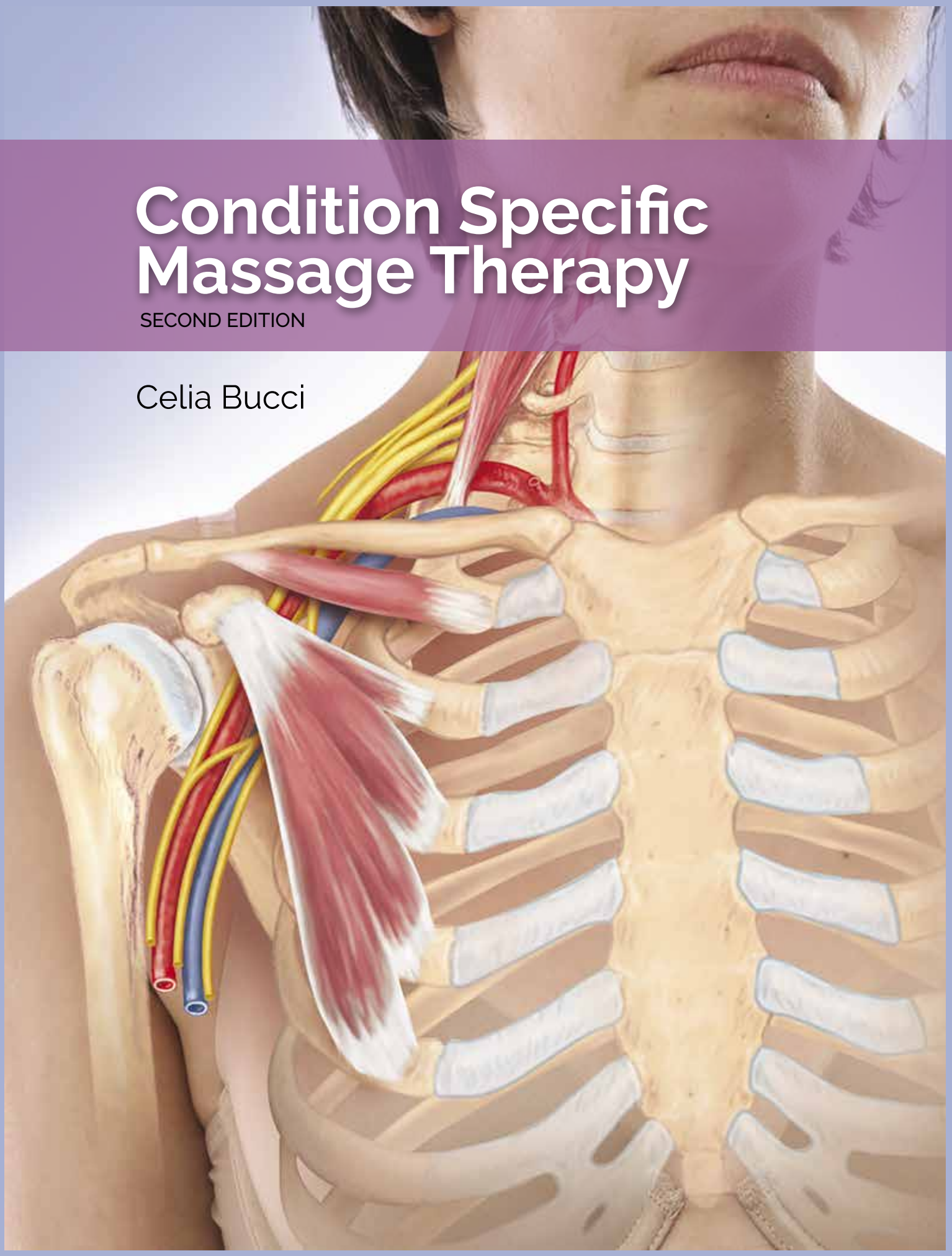
Werner R. *A Massage Therapist's Guide to Pathology*, 4th ed. Philadelphia, PA: Lippincott Williams & Wilkins, 2009.

Zito G, Jull G, Story I. Clinical tests of musculoskeletal dysfunction in the diagnosis of cervicogenic headache. Manual Therapy. 2006;11(2):118–129.

Condition Specific Massage Therapy

SECOND EDITION

Celia Bucci



Chapter 6:

Thoracic Outlet Syndrome

Thoracic Outlet Syndrome

Understanding Thoracic Outlet Syndrome

The thoracic outlet is the space between the base of the anterior lateral neck and the axilla (Fig. 1). A neurovascular bundle that includes the brachial plexus, the subclavian artery, and the subclavian vein passes through the thoracic outlet. Thoracic outlet syndrome refers to a collection of symptoms that occur when any of these structures become compressed. The symptoms are often vague, and there is no true consensus about the cause or diagnosis. The condition is called neurogenic thoracic outlet syndrome when the nerves are compressed, and vascular thoracic outlet syndrome when the blood vessels are compressed. Neurogenic thoracic outlet syndrome is most common, although occasionally, both occur simultaneously.

The nerve roots of the brachial plexus exit the spine between C5 and T1. These roots merge to form the superior, middle, and anterior trunks. Each trunk splits into anterior and posterior divisions, which then regroup to form the posterior, lateral, and medial cords; these later split into the branches that innervate the arm. Compression of the nerves slows the transmission of impulses; this can result in pain, burning, numbness, and tingling in the shoulder, axilla, lateral thorax, and down the arm to the hand. The subclavian artery, subclavian vein, and cervical lymph trunk also pass through the thoracic outlet. Compression of these structures can result in decreased blood supply to the arm, insufficient venous return, and lymphatic congestion, causing swelling in the arm, pale or cool skin, and a weakened pulse.

When thoracic outlet syndrome has muscular contributing factors, postures and activities that shorten myofascial tissues and decrease the space through which the nerves and vessels pass may cause symptoms. There are three primary areas where muscular compression of the contents of the thoracic outlet occurs: between the anterior and middle scalenes (anterior scalene syndrome), beneath the clavicle and subclavius (costoclavicular syndrome), and beneath the pectoralis minor (pectoralis minor syndrome). Because common postures like working at a computer for extended periods often result in a head-forward posture, flexion and internal rotation of the shoulder, pronation of the forearm, and extension of the wrist, compression may occur at more than one of these sites, as well as beneath the pronator teres or in the carpal tunnel. Compression occurring at more than one site along the path of a peripheral nerve is called a double crush.

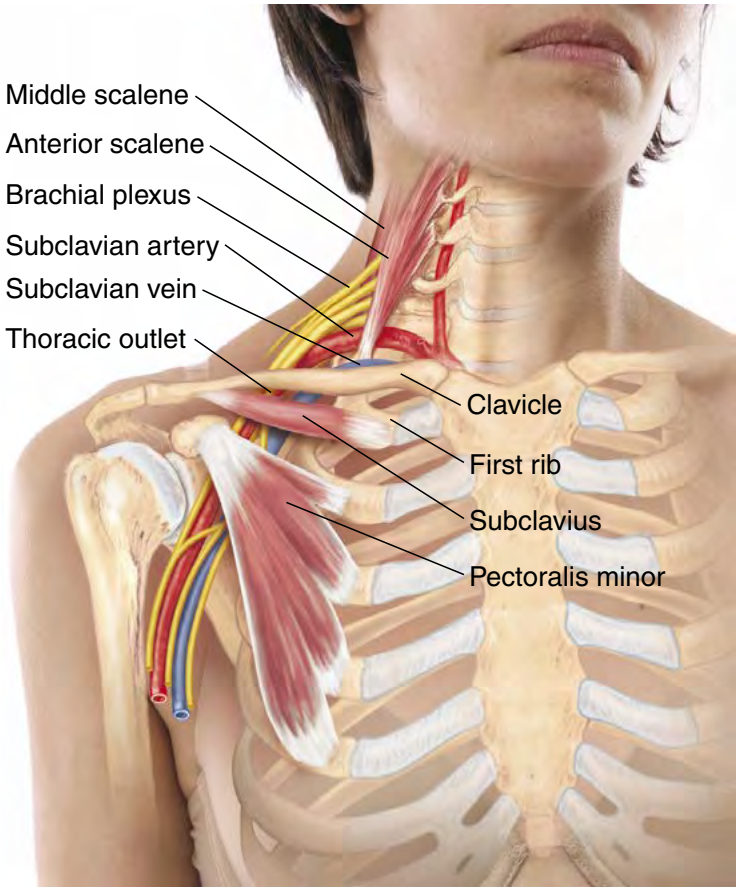


Figure 6-1 The thoracic outlet.

COMMON SIGNS AND SYMPTOMS

The symptoms of thoracic outlet syndrome usually begin gradually. Symptoms are commonly unilateral but may be bilateral. The signs and symptoms of neurogenic thoracic outlet syndrome include aching, pain, burning, numbness, or tingling in the shoulder, neck, arm, or hand of the affected side. Untreated, reduced innervation may lead to loss of tone, initially in the thenar muscles and eventually in the muscles of the arm and hand, causing reduced strength and fine motor skills. Atrophy may occur in advanced cases.

With vascular thoracic outlet syndrome, the client may experience the symptoms described above in addition to swelling, ischemia, and pain in the arm and hand or sensitivity to temperatures in the hand and fingers. The skin of the hand may be pale or bluish. Symptoms may mimic those of Raynaud's syndrome, namely cold fingers and pallor. The client may have a weak or absent pulse in the affected arm. Black spots on the hand and fingers may be present when decreased circulation affects the health of those tissues. In the worst-case scenario, vascular compression can be caused by blood clots, or can result in blood clots if left untreated. A client with these symptoms should be assessed by a medical professional prior to massage.

Because postural imbalance is often a contributing factor, the client may also have neck pain, chest pain, jaw pain, or frequent tension headaches. Note, however, that chest pain that refers to the jaw, throat, and arm may also be symptoms of a cardiac problem, which requires medical assessment prior to performing massage therapy. See Table 1 for conditions commonly confused with or contributing to thoracic outlet syndrome. Raising the arm above the head often intensifies the symptoms, particularly when lifting heavy objects. Lying down or gently moving the head and shoulder into a neutral position may reduce symptoms, particularly in the early stages of the syndrome.

Many people suffering from thoracic outlet syndrome are awakened from sleep by pain or tingling, often because they sleep with the head resting on the raised arm (Fig. 2). Disturbed sleep can contribute to a cycle in which fatigue exacerbates symptoms and produces anxiety and depression, which may in turn disturb sleep.

POSSIBLE CAUSES AND CONTRIBUTING FACTORS

Thoracic outlet syndrome is not a clearly defined condition but a collection of signs and symptoms associated with various contributing factors. Anatomically, a small percentage of people have a cervical rib—a bony prominence that emerges from the C7 transverse process and meets the lateral aspect of the first rib (Fig. 3). Cervical ribs are often unilateral but can be bilateral. The presence of a cervical rib, which can be palpated or seen on an X-ray, alters the path of the nerves and vessels as well as the shape of the surrounding soft tissues. In some

Figure 6-2 Sleeping on one side with the arm raised above the head.

cases, the C7 transverse process is unusually large, and while it does not form a complete cervical rib, its increased size can displace the tissues around it. Other bony prominences that may develop in the cervical or axillary region as a result of orthopedic disorders can also elicit symptoms. Hyperkyphosis, scoliosis, a subluxed cervical vertebra, or a herniated cervical disc can alter the anatomy of the thoracic outlet and may contribute to symptoms. For example, scoliosis in the thoracic spine will affect the balance of the cervical vertebrae to which the scalenes are attached, potentially shortening the scalenes, which may lead to trigger points and compression of the nerves and vessels passing through the thoracic outlet.

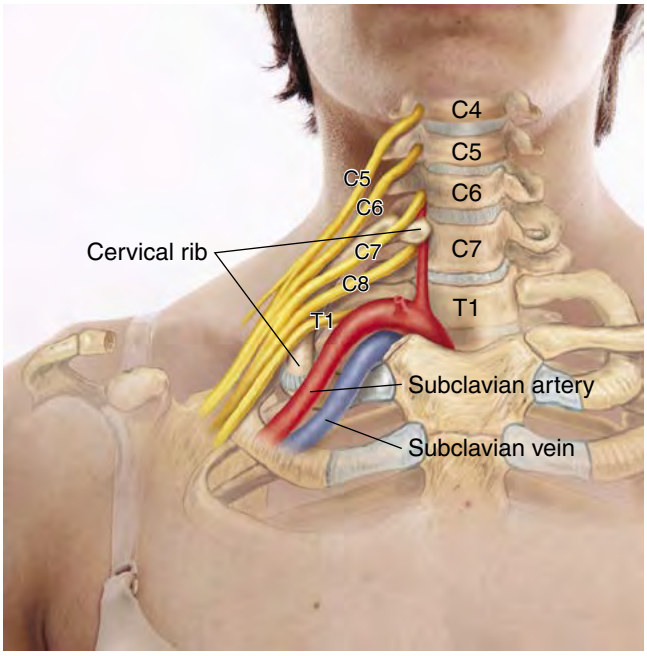


Figure 6-3 Cervical rib.

Symptoms of thoracic outlet syndrome may also develop with the use of crutches or any other device or posture that puts pressure on the structures in the axillary region. Weak shoulder muscles may cause a drooping of the shoulder, which causes the clavicle to fall upon the first rib, resulting in compression. Previous traumas including whiplash, rotator cuff injuries, or a fractured clavicle or humerus that were not successfully treated may result in adhesions, scar tissue, compensating patterns, and trigger points that contribute to thoracic outlet symptoms.

The most common postural imbalances that contribute to the symptoms of thoracic outlet syndrome are identical to those of hyperkyphosis. The main difference is that with thoracic outlet syndrome, these postural imbalances have led to the compression of nerves and vessels, causing numbness, tingling, and swelling whereas the symptoms of hyperkyphosis are primarily pain and reduced ROM. Holding postures that include extension and rotation of the neck; head-forward posture; and abduction, flexion, and internal rotation of the shoulder also contribute to the symptoms of this syndrome. People who work at a computer for long periods, teachers who write frequently on a blackboard, cashiers, house painters, and those in any profession in which the neck and shoulders are held in a static position or in which repetitive actions involve flexion and rotation of the shoulder, particularly above the head, are at risk. Athletes whose activities involve forced movement of the shoulder, such as tennis, golf, and volleyball players, are also at risk.

Hypertonicity and trigger points in the anterior and middle scalenes, subclavius, and pectoralis minor are the most common contributing factors and are the focus of the treatment described in this chapter. Any increase in the tone of these muscles can decrease the amount of space through which the brachial plexus and accompanying vessels travel. However, because of the frequent involvement of postural and respiratory abnormalities, nearly all of the muscles attached to the cervical vertebrae, scapulae, or ribs or those that cross the glenohumeral joint may be hypertonic or may develop trigger points. Referral patterns for trigger points in the latissimus dorsi, serratus anterior, and serratus posterior superior can be confused with the symptoms of thoracic outlet syndrome and may be the result of postural deviations that contribute to thoracic outlet syndrome. Other muscles that are not directly involved but may be peripherally involved include the coracobrachialis, anterior deltoid, biceps, upper and middle trapezius, levator scapulae, and SCM because of their attachment sites and their roles in postural imbalances.

Neurogenic thoracic outlet syndrome is a peripheral neuropathy. Systemic disorders including diabetes, hyperthyroid, and rheumatoid arthritis may contribute to the development of peripheral neuropathies. Smoking cigarettes—although not a cause of thoracic outlet syndrome—exacerbates the inflammatory process and can intensify symptoms. In addition, because thoracic outlet syndrome may involve the muscles of res-

piration, the repeated deep inhalation and exhalation associated with smoking, along with chronic respiratory disorders and coughing, can contribute to hypertonicity in these muscles. Thoracic outlet syndrome may also develop during pregnancy because of increased fluid and postural changes, but this usually resolves itself following delivery. Alcoholism, poor nutrition, vitamin B deficiency, and general stress may also contribute to or exacerbate symptoms.

Because so many factors may potentially contribute to thoracic outlet syndrome, it is important to understand the client's health history before proceeding with treatment. Many of the conditions listed above have contraindications for massage therapy or require adjustments to treatment. Refer the client to their health care provider for medical assessment if you suspect any systemic condition. If the client has been diagnosed with a condition that requires special consideration when planning massage, discuss treatment with the client's health care provider and adjust accordingly. Table 1 lists conditions commonly confused with or that contribute to thoracic outlet syndrome.

Table 6-1: **Differentiating Conditions Commonly Confused with or Contributing to Thoracic Outlet Syndrome**

CONDITION	TYPICAL SIGNS & SYMPTOMS	TESTING	MASSAGE THERAPY
Herniated disc C4-5	Symptoms may increase when coughing, laughing, and straining Weak deltoid Shoulder pain Usually no radiating pain or paresthesia	Kemp's test Spurling's test CT scan Myelography MRI	Massage is indicated with caution and proper training. Acute inflammation and acute injury are contraindications. Work with the health care team.
C5-6	Weak biceps and wrist extensors Pain and paresthesia in radial distribution		
C6-7	Weak triceps and finger extensors Pain and paresthesia down posterior arm into third digit		
C7-T1	Weak hand grip Pain and paresthesia in ulnar distribution		
Cervical spondylosis (cervical arthritis)	Neck pain that may radiate to the shoulder or arms Loss of or abnormal sensation in the shoulder or arms Weak arms Stiff neck that gradually worsens Loss of balance Headache Loss of bladder or bowel control	X-ray CT scan MRI Myelogram EMG	Massage is indicated with caution. In cases of nerve impingement or spurs that irritate nerves, work with a health care provider. Position client to reduce symptoms, and do not remove protective muscle splinting.

Table 6-1: Differentiating Conditions Commonly Confused with or Contributing to Thoracic Outlet Syndrome (continued)

CONDITION	TYPICAL SIGNS & SYMPTOMS	TESTING	MASSAGE THERAPY
Nerve root compression (radiculopathy)	Muscle spasm, weakness, or atrophy Pain around the scapula on the affected side Neck pain Pain radiates to extremities Pain worsens with lateral flexion or rotation or when sneezing, coughing, laughing, or straining	Spurling's test Valsalva's test Neurological exam to test reflexes, sensation, and strength	Massage is indicated if cause and location are understood. Take care not to increase compression or reproduce symptoms.
Tendinitis (biceps, forearm, or rotator cuff)	Local inflammation and point tenderness No muscle wasting	Pain on full passive stretch of the joint that the tendon crosses; pain with resisted activity	See Tendinitis
Pronator teres syndrome	Pain in forearm, worsened by elbow flexion/extension Absence of pain during the night	Resisted pronation of the forearm (excluding resistance to the wrist) Tinel's sign at the median nerve as it passes under the pronator teres	Massage is indicated
Hypothyroid condition	Weakness, fatigue, intolerance to cold, constipation, unintentional weight gain, brittle hair and nails, dry skin, puffy skin, hoarse voice, sleep disturbance, and mood swings	Physical exam T3, T4, and Serum TSH laboratory tests	Massage is indicated when no other contraindicated condition, such as a circulatory complication, is present.
Rheumatoid arthritis	Fatigue, loss of appetite, low-grade fever, bilateral nonspecific muscle pain, rheumatic nodules, periods of flares and remission	Physical exam Blood tests X-ray	Massage is indicated in nonacute stages. Work with health care team.
Angina pectoris	Chest pain Pain in arms, neck, jaw, shoulder, or back in addition to chest pain Nausea Fatigue Shortness of breath Anxiety Sweating	Physical exam Risk factors Blood test Electrocardiogram Stress test Chest X-ray Echocardiogram CT scan	Trigger points in pectoralis major may mimic some symptoms of angina pectoris. If the client presents with risk factors or the symptoms listed here, refer them to a health care provider prior to treatment. When risk factors are present, massage is indicated only if cleared by a primary health care provider, and if client is able to perform normal activities of daily living.
Diabetes	Frequent urination, frequent thirst, increased appetite, fatigue, nausea	Physical exam Fasting blood sugar test	Massage is indicated when tissues and circulation are not compromised.

Table 6-1: Differentiating Conditions Commonly Confused with or Contributing to Thoracic Outlet Syndrome (continued)

CONDITION	TYPICAL SIGNS & SYMPTOMS	TESTING	MASSAGE THERAPY
Cervical stenosis	Pain, weakness, and numbness in the shoulders, arms, and legs Clumsy fine motor skills Balance disturbance	Physical exam X-ray MRI CT scan Myelogram Bone scan	Massage is indicated with caution. Work with a health care provider. Client may receive corticosteroid injections or may be using anti-inflammatory medication.
Tumors (axillary, first rib, pancoast, nerve sheath, and spinal cord)	Signs and symptoms vary depending on type and location of tumor. General characteristics for tumors affecting the thoracic outlet include the following: Pain, often severe and constant, in shoulder and scapula that radiates to the arm and hand Weakening, atrophy, and numbness or tingling in the arm and hand Paraplegia	CT scan MRI Pet scan CBC Biopsy Chest X-ray	Refer client to health care provider if you suspect a tumor. Work with the health care provider if a tumor has been diagnosed. Recommendations for massage depend on the type and location of the tumor.
Shoulder injuries (impingement, rotator cuff tears, and adhesive capsulitis)	Often gradual onset with spontaneous resolution Minor pain at rest; acute pain with activity, which may radiate down the arm Pain often worse at night, disrupting sleep Weakness, reduced ROM in shoulder Tenderness and swelling in shoulder Gradual loss of ROM	Physical exam X-ray MRI	Massage is indicated. Work with the health care team.
Carpal tunnel syndrome	Pain, numbness, and tingling in thumb, index, and middle fingers, and lateral half of ring finger Gradual atrophy and reduced fine motor skills	Phalen's test Tinel's sign EMG nerve conduction test	See Carpal Tunnel
Temporomandibular joint disorder	Difficulty biting or chewing Clicking sound when moving jaw Aching in the jaw and face Earache Headache Reduced ROM in mandible	Dental exam MRI X-ray Palpation of muscles of mastication	Massage is indicated

Table 6-1: **Differentiating Conditions Commonly Confused with or Contributing to Thoracic Outlet Syndrome (continued)**

CONDITION	TYPICAL SIGNS & SYMPTOMS	TESTING	MASSAGE THERAPY
Raynaud's disease	Cold hands and feet White or blue skin Dulled sensation Numbness or pain as extremities warm	Signs and symptoms Rule out conditions causing similar symptoms such as nerve damage Tests for underlying causes Cold simulation test Nail bed or nailfold capillaroscopy Antinuclear antibodies test Erythrocyte sedimentation rate	Raynaud's that is not linked to an underlying condition is indicated for massage. If Raynaud's disease is associated with another condition, follow the guidelines for that condition.
Reflex sympathetic dystrophy syndrome (complex regional pain syndrome)	Often preceded by injury Severe, burning pain that is more intense than the severity of injury and gets worse over time Changes in skin temperature, color, texture, and sensitivity Changes in nail and hair growth Sweating Swelling Joint stiffness Reduced ROM	Signs and symptoms Ruling out other conditions Bone scans	Sufferers of RSDS may not tolerate touch in the affected area. If the client is willing, massage is indicated on or around the affected area.

CONTRAINDICATIONS AND SPECIAL CONSIDERATIONS

It is essential to understand the factors contributing to thoracic outlet syndrome. If a systemic condition or structural abnormality is present, work with the client's health care provider and consult a pathology text for massage therapists before proceeding. Following are a few general contraindications:

- **Underlying pathologies.** The signs and symptoms of thoracic outlet syndrome may result from a wide variety of underlying conditions. If you suspect one of these (consult Table 1 and your pathology book for signs and symptoms) or if the client shows signs of vascular compression, refer the client to their health care provider for medical assessment before initiating treatment. If the client is diagnosed with an underlying pathology that is not a contraindication for massage, work with the health care provider when necessary to develop an appropriate treatment plan.
- **Edema.** If edema is present, do not work directly on the site. Work proximally, moving the fluid toward the nearest proximal lymph nodes. If vascular compression is a consideration but massage is not contraindicated for the client, do not allow the arm to fall below the heart because gravity may draw fluid into the arm and hand. Bolster the arm if necessary to keep fluid from accumulating.
- **Treatment duration and pressure.** If the client is elderly, has degenerative bone disease, or has been diagnosed with a condition that diminishes activities of daily living, you may need to adjust your pressure as well as the treatment duration. Frequent half-hour sessions may suit the client better.

- **Positioning.** Use bolsters to position a client for comfort as well as to correct postures that may reproduce symptoms. If the head-forward posture or extension of the neck is evident, placing a small bolster under the occiput in the supine position and adjusting the face cradle to reduce the extension of the neck in the prone position may help. A bolster along the length of the spine in the supine position reduces the protraction of the scapulae and the extension of the neck. Bolsters under the shoulders in the prone position reduce the protraction of the scapulae and lengthen the pectoral muscles.
- **Reproducing symptoms.** Symptoms may occur during treatment if you manually compress the neurovascular bundle or if the client's posture causes structures to compress this area. If treatment produces symptoms, first adjust the client to a more neutral posture to relieve compression. If this does not relieve the symptoms, reduce your pressure or move away from the area. You may be able to treat around the site that reproduced the symptoms, but proceed with caution.
- **Hydrotherapy.** Do not use moist heat on the neck or chest if the client has a cardiovascular condition that may be affected by the dilation of blood vessels. Severe hypertension and atherosclerosis are two examples of conditions that are contraindicated for hydrotherapy. Consult your pathology book for recommendations. Do not use heat in areas of edema or inflammation, because heat dilates vessels and may increase the accumulation of fluid.
- **Friction.** Do not use deep frictions if the client has a systemic inflammatory condition, such as rheumatoid arthritis or osteoarthritis, if the health of the underlying tissues is compromised or if the client is taking anti-inflammatory medication. Friction initiates an inflammatory process, which may interfere with the intended action of the anti-inflammatory medication. Recommend that your client refrain from taking such medication for several hours prior to treatment if their health care provider is in agreement.
- **Tissue length.** It is important when treating soft tissues that you do not further stretch those that are already overstretched. Assess for myofascial restrictions first and treat only those that are clearly present. Likewise, overstretched muscles should not be stretched from origin to insertion. If you treat trigger points in a muscle that is overstretched, use heat or a localized pin and stretch technique to lengthen that area.
- **Mobilizations.** Be cautious with mobilizations if the client has degenerative disc disease, rheumatoid arthritis, a cervical rib, hypermobile joints, or if ligaments are unstable from pregnancy or a systemic condition.

MASSAGE THERAPY RESEARCH

Although articles about the benefits of conservative treatment have been published and abundant anecdotal evidence suggests recovery from symptoms is possible following massage, there are currently no extensive experimental investigations into the specific outcomes following massage for the treatment of thoracic outlet syndrome. Much of the research on treatment for thoracic outlet syndrome focuses on pharmaceutical muscle blocks and surgery. Much of the theory behind the use of massage in the treatment of thoracic outlet syndrome has been adapted from other disciplines. Studies conducted by trained therapists into specific outcomes using only massage are needed.

In 1996, Barnes published an article titled "Myofascial Release in Treatment of Thoracic Outlet Syndrome" describing a single treatment program. The client had a 2-year history of chronic pain in her neck, upper extremities, and whole back initiated by an injury to the posterior mid thorax. The client saw many physicians in a variety of specialties and several physical therapists and took dozens of medications in various combinations with no lasting results. Her level of function was reduced; she needed help dressing and grew tired after even minimal writing. Her medical diagnosis at the time she was referred to Barnes' clinic was thoracic outlet

syndrome. The client received 30-minute treatments two or three times a day for 2 weeks by a team of physical therapists trained in myofascial release. The client was able to sleep comfortably without using bolsters after the fourth treatment. The client's mobility increased, and she was walking and climbing stairs by the end of the 2-week program. She continued to have difficulty with fine motor skills. Although the positive outcome suggests the benefits of manual therapy for clients with thoracic outlet syndrome, this case study involves a single, severe case complicated by multiple diagnoses that was treated intensively. Further study is needed.

In 1999, Peng published a study titled "16 Cases of Scalenus Syndrome Treated by Massage and Acupoint-Injection." The 16 participants in this study were all female, between 20 and 40 years of age, who had symptoms from 3 months to 4 years prior to treatment. Each had had a previous injury to the shoulder. One of the participants had a cervical rib. All had a positive Adson's test. Of the 16 participants, 12 had vascular symptoms including a cold affected limb, 9 presented with impaired fine motor skills, and 4 showed thenar atrophy. In the seated position with the neck as relaxed as possible, manual manipulations were applied to the shoulder and medial arm followed by kneading and compression of acupoints, which are known in the system of Chinese medicine, while the limb was mobilized. The arm was then shaken and rubbed until the skin warmed. This treatment was performed every day. The study does not state the precise treatment program, only that the relief of symptoms required one or two courses of treatment for 20–40 days. In addition to manual therapy, these clients received an acupoint-injection containing procaine hydrochloride and vitamin B12 once every 5 days followed by infrared radiation. According to the author, all but one client was cured. Only the client with the cervical rib continued to have pain and numbness in the arm, but even this client had a negative Adson's test after treatment. Again, this study did not isolate the effects of massage from another form of treatment, in this case acupoint-injection. In addition, few details are provided regarding relief of neurogenic or vascular symptoms or changes in ROM; it is stated only that the client was cured. Although the results are encouraging, further study is necessary.

In 2006, Michael Hamm published a case study titled "Impact of Massage Therapy in the Treatment of Linked Pathologies: Scoliosis, Costovertebral Dysfunction, and Thoracic Outlet Syndrome." As the title suggests, this case also involved a client with multiple conditions. The client presented with pain and weakness in the right shoulder and arm that had increased progressively over the previous 8 months. She was regularly awakened by symptoms and ultimately had to quit her job as a waitress. Chiropractic diagnoses included scoliosis, costovertebral dysfunction, and thoracic outlet syndrome. The client received eight 60-minute treatments over the course of 4 weeks, which included deep tissue massage, neuromuscular therapy, and muscle energy techniques. Following this treatment plan, the client slept better, ROM increased, postural imbalances in the ilia and spine showed improvement, and pain with shoulder activity reduced by 50%. Other longstanding postural imbalances responded less significantly. As the author suggests, further research is needed. He recommends using more precise measurements of bony alignments that will allow for more accurate results upon follow-up, and using a standard measure for psychological stress to include this dimension of musculoskeletal dysfunction. The author also recommends a larger-scale study of massage to treat linked diseases concurrently. The study offers minimal data regarding increased strength or changes in neurogenic or vascular symptoms common to thoracic outlet syndrome. Although the results are encouraging, further research that considers thoracic outlet syndrome independently is needed.

Working With the Client

CLIENT ASSESSMENT

Assessment begins with your first contact with a client. In some cases, this may be on the telephone when an appointment is requested. Ask in advance if the client is seeking treatment for a specific pain so that you can prepare yourself. It is essential that your assessment is thorough. If you suspect an underlying condition that requires medical attention, refer the client to a health care provider for assessment. If the client

is diagnosed with an underlying condition, research the contraindications or special considerations for the condition. During your assessment, ask questions that will help you to differentiate the possible causes of thoracic outlet syndrome.

Table 2 lists questions to ask the client when taking a health history.

Table 6-2: **Health History**

QUESTIONS FOR THE CLIENT	IMPORTANCE FOR THE TREATMENT PLAN
Where do you feel symptoms?	The location of symptoms gives clues to the location of trigger points, injury, or other contributing factors.
Describe what your symptoms feel like.	Differentiate between possible origins of symptoms, and determine the involvement of nerves or blood vessels.
How long have you had symptoms?	Onset may coincide with an illness or trauma and may help you to assess the extent of the injury.
Do any movements make it worse or better?	Locate tension, weakness, or compression in structures producing such movements.
Have you seen a health care provider for this condition? What was the diagnosis? What tests were performed?	A cervical rib or other bony prominence is most accurately assessed with an X-ray. Vascular insufficiency should be assessed by a health care provider.
Have you been diagnosed with a condition such as diabetes, rheumatoid arthritis, a thyroid condition, or a respiratory condition? Are you pregnant?	Systemic conditions may contribute to signs and symptoms, may require adjustments to treatment, and may impact treatment outcomes. Fluid retention and changes in posture during pregnancy can contribute to signs and symptoms.
Have you had an injury or surgery?	Injury or surgery and resulting scar tissue may cause adhesions, hyper- or hypotonicity, and atypical ROM. The use of crutches may contribute to thoracic outlet syndrome.
What type of work, hobbies, or other regular activities do you do?	Repetitive motions and static postures that increase thoracic flexion, protracted scapulae, cervical extension, or a head-forward posture may contribute to the client's condition.
Are you taking any prescribed medications or herbal or other supplements?	Medication of all types may contribute to symptoms or involve contraindications or cautions.
Have you had a cortisone shot in the past 2 weeks? Where?	Local massage is contraindicated.
Have you taken a pain reliever or muscle relaxant within the past 4 hours?	The client may not be able to judge your pressure.
Have you taken anti-inflammatory medication within the past 4 hours?	Deep friction causes inflammation and should not be performed if the client has recently taken anti-inflammatory medication.

Postural Assessment

Allow the client to enter the room ahead of you while you assess their posture and movements. Look for imbalances or patterns of compensation due to pain or restriction. In the case of thoracic outlet syndrome, have the client turn the doorknob to enter the room, pick up a pen, or grasp a cup of water without making them aware that you have begun your assessment. Do not hand these things to the client but allow them to pick them up. If the client performs these tasks clumsily with the affected arm, or performs them with the unaffected arm, particularly if it is the nondominant side, it could indicate a compensation pattern due to weakness in the affected arm.

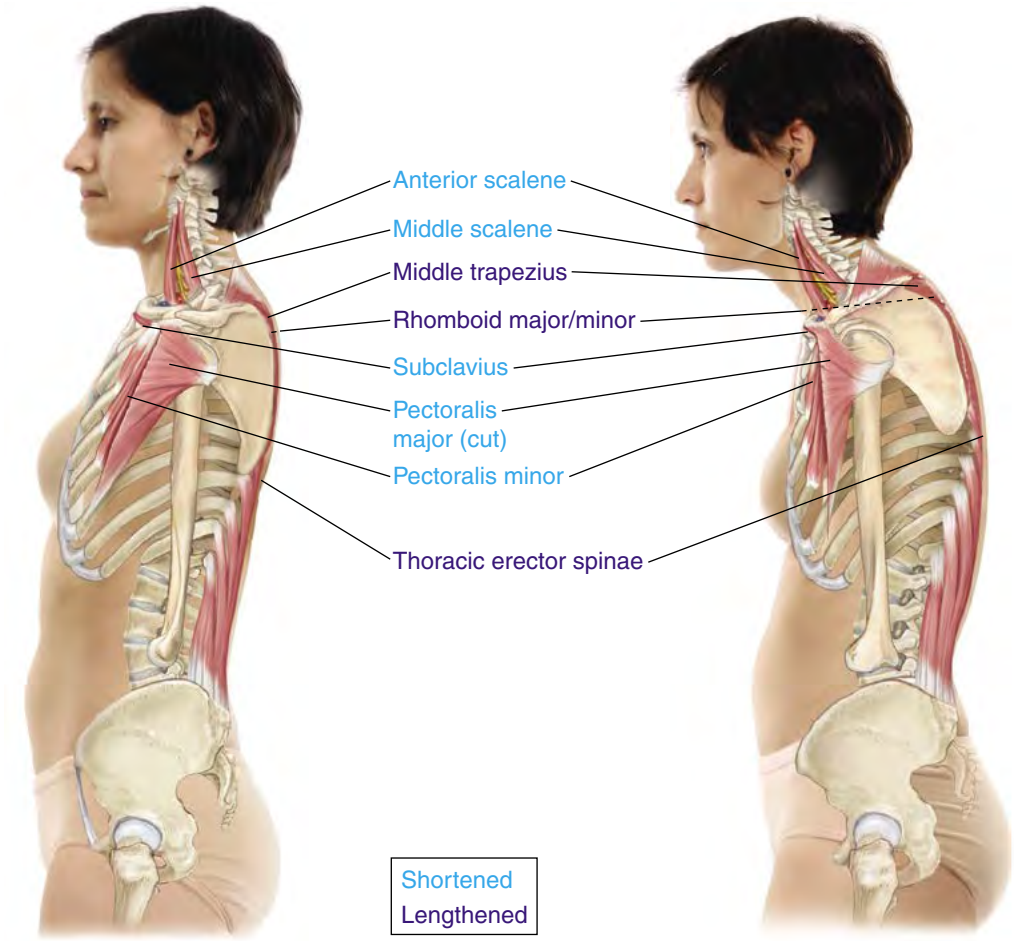


Figure 6-4 Postural assessment comparison. Compare the anatomical posture on the left to the deviated posture on the right.

Because the symptoms of thoracic outlet syndrome can be confused with those of other musculoskeletal conditions, it is important to asses the client's posture thoroughly. If you are performing 30 minutes of treatment in the area of compression, it is best to use the remaining time to target related contributing factors. For example, if your assessment of the client reveals lateral flexion of the thorax, spend some time lengthening the muscles that flex the thorax. Clients with thoracic outlet syndrome may also present with hyperkyphosis. The head-forward posture, a drooped or elevated shoulder, and internally rotated shoulders typically contribute to the compression of the brachial plexus. Figure 4 compares the anatomic position to the posture affected by thoracic outlet syndrome.

ROM Assessment

Test the ROM of the neck and shoulders, assessing the length and strength of both agonists and antagonists that cross the joints being tested. Since it allows the client to control the amount of movement and stay within a pain-free range, only active ROM should be used in the acute stage of an injury to prevent undue pain or re-injury. Box 1 presents the average active ROM results for the joints involved in thoracic outlet syndrome.

Active ROM

Compare your assessment of the client's active ROM to the values in Box 1. Pain and other symptoms may not be reproduced with active ROM assessment, because the client may limit movement to the symptom-free range.

Box 6-1: Average Active ROM for Joints Involved in Patellofemoral Syndrome

Cervical Spine

Flexion 60˚
- SCM (bilateral)
- Anterior scalenes (bilateral)
- Longus capitis (bilateral)
- Longus colli (bilateral)

Extension 55˚
- Upper trapezius (bilateral)
- Levator scapulae (bilateral)
- Splenius capitis (bilateral)
- Splenius cervicis (bilateral)
- Rectus capitis (bilateral)
- Oblique capitis superior (bilateral)
- Semispinalis capitis (bilateral)
- Longissimus capitis (bilateral)
- Longissimus cervicis (bilateral)
- Iliocostalis cervicis (bilateral)

Lateral Flexion 20–45˚
- Upper trapezius (unilateral)
- Levator scapulae (unilateral)
- Splenius capitis (unilateral)
- Splenius cervicis (unilateral)
- SCM (unilateral)
- Longus capitis (unilateral)
- Longus colli (unilateral)
- Anterior scalene (unilateral)
- Middle scalene (unilateral)
- Posterior scalene (unilateral)
- Longissimus capitis (unilateral)
- Longissimus cervicis (unilateral)
- Iliocostalis cervicis (unilateral)

Ipsilateral Rotation 70–90˚
- Levator scapulae (unilateral)
- Splenius capitis (unilateral)
- Splenius cervicis (unilateral)
- Rectus capitis (unilateral)
- Oblique capitis (unilateral)
- Longus colli (unilateral)
- Longus capitis (unilateral)
- Longissimus capitis (unilateral)
- Longissimus cervicis (unilateral)
- Iliocostalis cervicis (unilateral)

Contralateral Rotation 70–90˚
- Upper trapezius (unilateral)
- SCM (unilateral)
- Anterior scalene (unilateral)
- Middle scalene (unilateral)
- Posterior scalene (unilateral)

Shoulder

Flexion 180˚
- Anterior deltoid
- Pectoralis major (upper fibers)
- Biceps brachii
- Coracobrachialis

Extension 50–60˚
- Posterior deltoid
- Latissimus dorsi
- Teres major & minor
- Infraspinatus
- Pectoralis major (lower fibers)
- Triceps brachii

Internal Rotation 60–100˚
- Anterior deltoid
- Latissimus dorsi
- Teres major
- Subscapularis
- Pectoralis major

External Rotation 80–90˚
- Posterior deltoid
- Infraspinatus
- Teres minor

Abduction 180˚
- Deltoids
- Supraspinatus

Adduction 50–75˚
- Latissimus dorsi
- Teres major
- Infraspinatus
- Teres minor
- Pectoralis major
- Triceps brachii (long head)
- Coracobrachialis

Horizontal Abduction 45˚
- Posterior deltoid
- Infraspinatus
- Teres minor

Horizontal Adduction 130˚
- Anterior deltoid
- Pectoralis major (upper fibers)

- **Active contralateral rotation and ipsilateral lateral flexion of the cervical spine** on the affected side may cause pain due to trigger points in the scalenes. Ipsilateral rotation and contralateral lateral flexion may also be reduced and produce symptoms when the shortened scalenes are stretched, or cause discomfort on the unaffected side because of weakened antagonists. Active rotation and flexion of the cervical spine may reproduce symptoms.
- **Active extension of the cervical spine** may be reduced or reproduce symptoms and pain when the shortened anterior scalene is stretched.
- **Active external rotation, abduction, and flexion of the shoulder** may be reduced or produce symptoms when trigger points or hypertonicity in the pectorals limits motion in the shoulder.

Passive ROM

Compare the client's P ROM on one side to the other when applicable. Note and compare the end feel for each range. The client may resist even passive movement if this movement causes pain in their daily life. Symptoms of pain, numbness, and tingling may also occur.

- **Passive ipsilateral rotation and contralateral lateral flexion of the cervical spine** on the affected side may be reduced and may reproduce symptoms as the hypertonic scalenes are stretched.
- **Passive extension of the cervical spine** may be reduced and may reproduce symptoms when the anterior scalene is stretched.
- **Passive external rotation, abduction, or flexion of the shoulder** may be reduced due to myofascial restrictions and hypertonic pectorals.

Resisted ROM

Use resisted tests to assess the strength of the muscles that cross the joints involved. Compare the strength of the affected side to the unaffected side.

- **Resisted contralateral rotation and ipsilateral lateral flexion of the cervical spine** on the affected side may cause pain and reproduce symptoms. Resisted ipsilateral rotation and contralateral lateral flexion may reveal weakness in the antagonists.
- **Resisted flexion of the cervical spine** may reproduce symptoms.
- **Resisted internal rotation, abduction, or flexion of the shoulder** may reproduce symptoms or result in pain.
- **Resisted extension or external rotation of the shoulder** may reveal weakness in the antagonists with regard to flexion and internal rotation of the shoulder.
- **Resisted flexion of the elbow, flexion or extension of the wrist and fingers, and grasping** may reveal weakness if thoracic outlet syndrome has led to atrophy of the muscles involved in those actions.

Special Tests

The **Roos elevated arm stress test** is intended to test for thoracic outlet syndrome (Fig. 5).

1. Ask the client to abduct the shoulders 90°, laterally rotate the shoulders 180°, flex the elbows 90°, and slightly retract the scapulae.
2. Once in this position, ask the client to flex and extend the fingers (open and close the hands) for as long as the client can tolerate, up to a maximum of 3 minutes.
3. If the client is unable to hold the position for 3 minutes, feels intense heaviness or weakness in the affected arm, or feels numbness and tingling in the fingers of the affected side, the test is considered positive for thoracic outlet syndrome. Minor weakness or fatigue do not suggest thoracic outlet syndrome.

Figure 6-5 Roos stress test.

Figure 6-6 Adson's test.

Figure 6-7 Costoclavicular maneuver.

Adson's test assesses the compression of the neurovascular bundle by the scalenes (Fig. 6).

1. Stand behind the seated client.
2. Passively abduct and externally rotate the shoulder on the affected side.
3. Place your fingers on the radial pulse and note its strength.
4. Once you have assessed the strength of the pulse, ask the client to extend the neck and rotate it toward the affected side. In this position, the client should take a full, deep breath and hold it for 15–20 seconds or as long as possible, up to 20 seconds. Taking a breath raises the first rib and contracts the anterior scalene.
5. A decreased or absent pulse or the recurrence of pain or tingling in the arm and hand indicates a positive test for compression of the nerves and vessels by the anterior scalene.

The **costoclavicular maneuver** assesses for compression of the neurovascular bundle between the clavicle/subclavius and the first rib (Fig. 7).

1. Stand behind the seated client.
2. Place your fingers on the radial pulse, and note its strength.
3. Once you have assessed the strength of the pulse, ask the client to depress and extend the shoulder.

Figure 6-8 Wright's test.

4. In this position, ask the client to take a breath deep enough to expand the chest and hold for 15–20 seconds or as long as possible, up to 20 seconds.
5. A decreased or absent pulse or the recurrence of pain or tingling in the arm and hand indicates a positive test for compression of the nerves and vessels between the clavicle/subclavius and the first rib.

Wright's test assesses compression of the neurovascular bundle by the pectoralis minor muscle (Fig. 8).

1. Ask the client to sit in a chair while you stand behind them.
2. Place your fingers on the radial pulse, and note its strength.
3. Once you have assessed the strength of the pulse, passively laterally rotate, abduct, and slightly extend the affected arm while keeping your fingers on the radial pulse.
4. A decreased or absent pulse or the recurrence of pain or tingling in the arm and hand indicates a positive test for compression of the nerves and vessels beneath the pectoralis minor.

Palpation Assessment

Assess the tissues of the neck, chest, shoulder, arm, forearm, and hand. Compare the affected to the unaffected side. Check the temperature, color, and texture of the superficial tissues. You may find fascial restrictions and tenderness in the lateral neck, beneath the clavicle, or around the anterior glenohumeral joint as well as in the muscles involved in any accompanying postural deviations such as the head-forward posture or hyperkyphosis. Depending on the duration and degree of compression of the brachial plexus, you may find atrophy, pale skin, swelling, reduced hair growth, ulcers, cyanosis, and possibly even necrosis of the tissues of the fingers and hand. If ulcers, cyanosis, or necrosis is present, refer the client to a health care provider for medical assessment.

CONDITION SPECIFIC MASSAGE

Since the causes of pain, numbness, and tingling in the arm and hand vary, it may be difficult to pinpoint the area of compression. Moreover, it is common for more than one area to be compressed at the same time. A client who works at a desk for long periods everyday is likely to be seated with the head jutting forward (affecting the scalenes), one or both scapulae elevated or depressed, one or both shoulders internally rotated (affecting the pectorals), the forearms pronated (affecting the pronator teres), and the wrists and fingers in flexion, extension, or moving constantly between these (affecting the contents of the carpal tunnel).

It is essential for treatment to be relaxing. You are not likely to eliminate the symptoms of thoracic outlet syndrome, or any of the conditions associated with it, in one treatment. Do not try to do so by treating aggressively. Be sure to ask your client to let you know if the amount of pressure you are applying keeps them from relaxing. If the client responds by tensing muscles or has a facial expression that looks distressed, reduce your pressure. Remember that you are working on tissue that is compromised.

It is also important for the client to let you know if any part of your treatment reproduces symptoms. Adjust the client to a more neutral position, reduce your pressure, or move slightly off the area if this occurs, and make a note about it as this may help you understand more clearly exactly which neuromuscular conditions are contributing to symptoms. Instruct your client to use deep but relaxing breathing to help with relaxation.

If deep palpation of a trigger point refers pain elsewhere, explain this to your client, and ask them to breathe deeply during the technique. As the trigger point is deactivated, the referred pain will also diminish. Scalene trigger points refer pain across the shoulder and along the medial border of the scapulae, into the chest, and down the lateral arm and forearm into the lateral hand. Subclavius trigger points refer pain across the clavicle, into the areas around the biceps and brachioradialis, and into the lateral hand. Pectoralis minor trigger points refer pain across the chest and into the areas of the anterior deltoid, down the medial arm

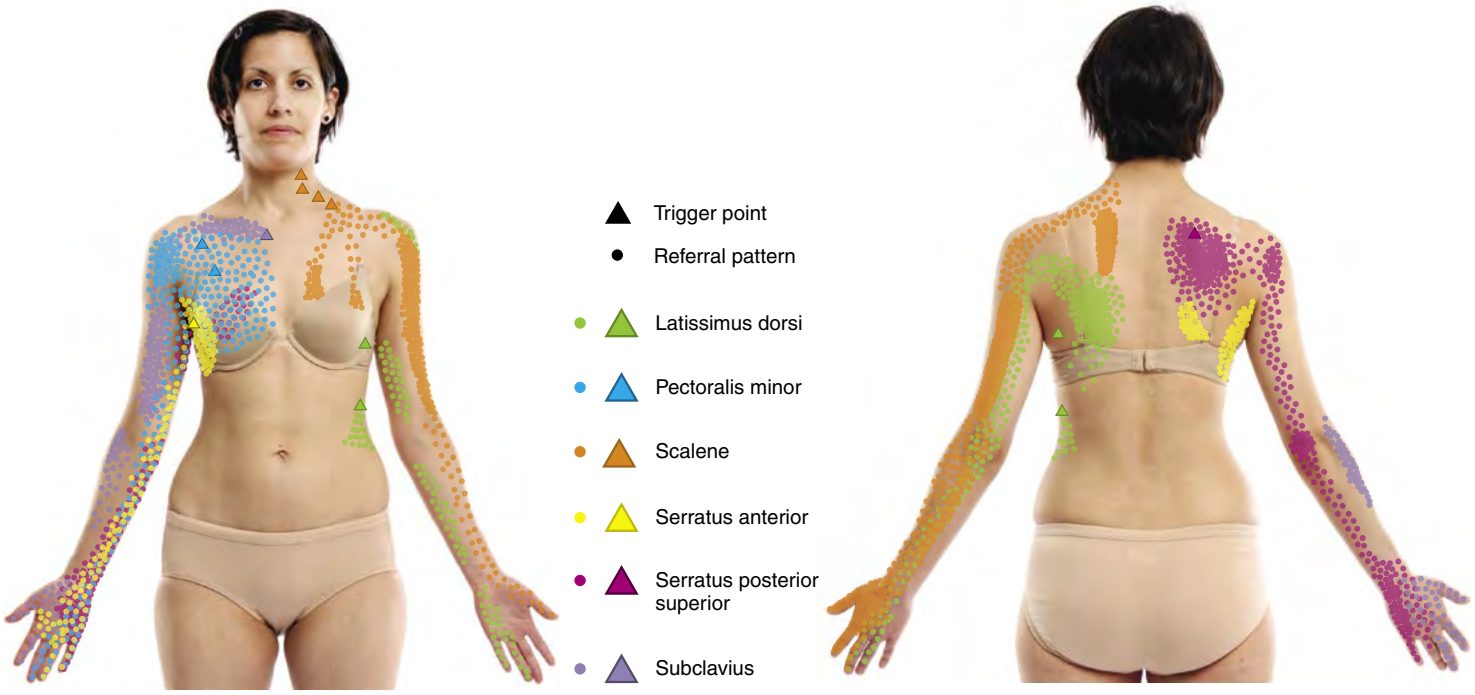


Figure 6-9 Common trigger points and referral.

and forearm, and into the palm and three middle fingers. Other muscles with trigger points that refer pain into the arm, forearm, and hand include the pectoralis major, sternalis, serratus anterior, serratus posterior superior, latissimus dorsi, muscles of the rotator cuff, and the triceps brachii. Most of the muscles of the arm and forearm refer pain into the wrist, hand, and fingers. Common trigger points and their referral patterns are shown in Figure 9.

The following suggestions are for treatment that considers several neuromuscular factors involved in producing pain, tingling, or numbness along the arm and into the hand. The section of this treatment that focuses on the anterior and middle scalene, subclavius, and pectoralis minor is specific for thoracic outlet syndrome. If the client has an acute injury, follow the PRICE (protect, rest, ice, compression, elevation) protocol. In this case, you may work conservatively proximal to the site but will have to avoid the injured area until the subacute or chronic stage.

Treatment Goals:

- Begin in the supine position, and initiate treatment on the affected side. If both arms are affected, begin on the dominant side. If edema is present, bolster the arm so that gravity will encourage venous return and the draining of fluid toward the proximal lymph nodes. If hyperkyphosis is a consideration, refer to that PDF for additional bolstering.

- Moist heat is indicated on the chest, neck, and shoulder unless the client has cardiovascular disease.

- Before applying emollient, assess the tissues of the upper cross for myofascial restrictions, and release them if indicated. Restrictions are often found around the glenohumeral joint, along the anterior deltoid, and along the lateral and posterior neck.


- Use warming strokes to superficially assess the tissues from the neck down to the hand and to begin superficial draining of accumulated fluid toward the nearest lymph nodes. You should be able to minimally assess the degree of tension in each area, which may help you to determine where to focus your time.


- Use broad strokes along the full length of the pectoralis major to soften tissues, allowing you to access the deeper structures.

- Assess pectoralis major for trigger points, and treat them if found. Common trigger points in the pectoralis major are found along the mid sternum, at the clavicular attachments, along the inferior fibers, and near the axilla.


- Assess and treat the subclavius for hypertonicity and trigger points. The subclavius is a slight, thin muscle and may not be easily palpated. Trust your knowledge of anatomy as you palpate along the inferior edge of the middle third of the clavicle toward the costal cartilage of the first rib. If you find and treat trigger points in the subclavius, use a pin and stretch technique to lengthen the muscle fibers.


- You can access the pectoralis minor through the pectoralis major or by pushing the lateral fibers of the pectoralis major medially as you palpate ribs 3, 4, and 5. This may be performed more easily by kneeling next to the client and placing their hand on your shoulder nearest the table, which will gently lift the pectoralis major out of the way. This is also preferable to externally rotating the shoulder, which may put tension on the pectorals and reproduce symptoms. Once you believe you have found it, ask the client to depress the shoulder and feel for a contraction. As you assess and treat the pectoralis minor for tension and trigger points, ask the client about the reproduction of symptoms. If they occur, adjust the client to a more neutral position, reduce pressure, or move away from the area. You may be able to revisit the pectoralis minor later in the treatment without reproducing symptoms.


- If you found myofascial restrictions, hypertonicity, and trigger points in the pectoral area, perform a full stretch to the pectorals and close with clearing strokes. If the tissue is resistant to lengthening, apply postisometric relaxation within the client's tolerance to encourage a normal resting tone. If you found the area to be only minimally affected, close with clearing strokes.


- Warm and lengthen the superficial neck muscles, namely the upper trapezius. Be careful to avoid endangerment areas, and back away gently if you feel a pulse.


- Reduce tension in the SCM, and treat any trigger points found. Trigger points in the SCM may cause vertigo, nausea, or ringing in the ears. Ask the client to let you know if they feel any unusual sensations, and explain that these are common referrals from SCM trigger points.
- Once you have softened the SCM and trapezius, you will have greater access to the scalenes. To access the anterior scalene, gently push the SCM medially with one or two fingertips as you feel for the deeper scalenes. As you move the SCM medially, your fingers should gently rest on the transverse processes of the cervical vertebrae. Use this as your guide for palpating the anterior scalene. Once you have found it, ask the client to take a quick, forced breath into the chest and feel for a contraction.



- Reduce tension and lengthen the anterior scalene. Treat any trigger points found. It is often helpful, once you have found a trigger point in the scalenes, to compress it gently while slowly rotating the head. Trigger points in the anterior scalene are often quite sensitive, and the client may feel cautious about you working deeply in the neck. Begin gently and slowly to avoid frightening the client or causing them to jerk the head. Remember that you are working in an area of many nerves and abundant vasculature.



- Find the middle scalene by gently palpating the transverse processes and then moving slightly posterior. The middle scalene crosses the transverse processes and heads toward the first rib. Once you have found it, ask the client to take a quick, forced breath into the chest and feel for a contraction. Take the same cautions with the middle scalene as with the anterior scalene to avoid frightening the client. Lengthen the muscle and treat any trigger points found.


- Stretch the scalenes by increasing the distance between their origins and insertions. Options for stretching include contralateral lateral flexion and ipsilateral rotation of the cervical spine (Fig. 10). If the tissue resists lengthening, apply postisometric relaxation within the client's tolerance to encourage a normal resting tone. If you found the area to be minimally affected, apply clearing strokes and move on to the arm and hand.



- Warm the whole arm and assess the muscles for myofascial restrictions, hypertonicity or hypotonicity, and trigger points. If the client has had symptoms for a long time, the muscles of the arm may be compensating. If you suspect pronator teres syndrome or carpal tunnel syndrome to be involved, assess and treat as time permits. You may be able to revisit these areas in a subsequent visit when primary symptoms subside. If you do not find compromised tissue in the arm, be conservative in your treatment of the arm to save time, but do not ignore it. It is important to perform at least the Swedish techniques to the arm to restore neuromuscular memory and function.
- Treat the unaffected side—superficially if you find no compromised tissue and comprehensively if the client's thoracic outlet syndrome is bilateral.

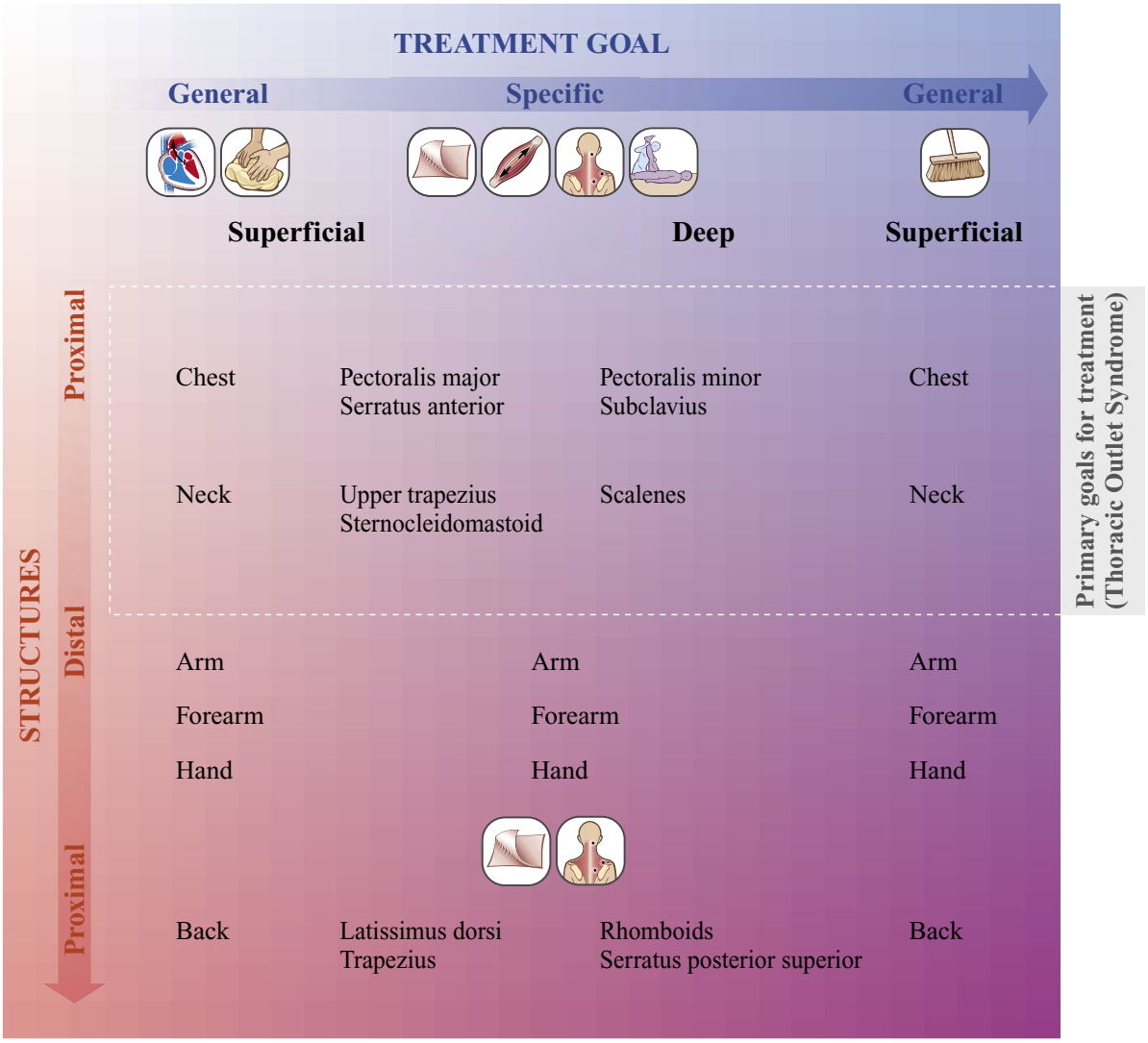


- Try to leave at least 10 minutes for work in the prone position. Referral patterns for trigger points in the latissimus dorsi, serratus anterior, and serratus posterior superior may be similar to the common pain pattern found in thoracic outlet syndrome. Assess and treat these muscles as time permits.
- Because hyperkyphosis is commonly associated with thoracic outlet syndrome, the muscles of the upper back are likely to be tender or painful, and this may be one of the client's primary complaints along with numbness and tingling in the arm and hand. Treat the back conservatively if time does not allow you to assess and treat trigger points. You can return to this in a subsequent visit once the symptoms of thoracic outlet syndrome begin to subside.

Figure 6-10 Scalene stretch.

- If the scapulae are protracted, remember to treat the rhomboids and middle trapezius from the scapulae toward the spine to avoid stretching them further. Trigger points can develop in overstretched muscles as well as hypertonic ones.

- Use a local pin and stretch to lengthen fibers that contained trigger points, and clear the area treated.



CLIENT SELF-CARE

The following are intended as general recommendations for stretching and strengthening muscles involved in thoracic outlet syndrome. The objective is to create distance between the attachment sites of muscles that have shortened and to perform repetitions of movements that decrease the distance between the attachments of muscles that have weakened. If you have had no training in remedial exercises and do not feel that you have a functional understanding of stretching and strengthening, refer the client to a professional with training in this area.

Clients often neglect self-care because their daily lives are busy. Encourage them to follow these guidelines:

- Instruct the client to perform self-care activities throughout the day, such as while taking a phone call, reading e-mail, watching television, or performing other activities of daily living, instead of setting aside extra time.
- Encourage your client to take regular breaks from repetitive actions or static postures.
- Demonstrate gentle self-massage to keep adhesions and hypertonicity at bay between treatments.
- Instruct the client on proper posture in the seated position to keep pressure off the weakened joints. Instruct clients with symptoms of thoracic outlet syndrome to sleep in positions without raising the arm over the head and without lateral flexion or rotation of the cervical spine.
- Instruct an athlete whose sport strengthens the pectorals and internal rotators of the shoulder to reduce pectoral resistance exercises and increase scapular retraction and thoracic extension to strengthen the middle trapezius, rhomboids, and thoracic erector spinae, balancing strength in the thoracic area.
- Instruct a client who regularly performs heavy lifting to lift with the legs instead of the back.
- Demonstrate all strengthening exercises and stretches to your client and have them perform these for you before leaving to ensure that they are performing them properly and will not harm himself or herself when practicing alone.

Stretching

Instruct the client to stretch the scalenes. Have the client hook the hand of the affected side under the chair while slowly and gently extending and laterally flexing the neck in the opposite direction until they feel a deep but comfortable stretch (Fig. 11). To increase the stretch, instruct the client to pull gently on the head with the opposite hand.

To stretch the pectoralis major and minor, instruct the client to clasp the hands behind the head, then retract and elevate the scapulae (Fig. 12). For a deeper stretch, instruct the client to stand in a doorway with the hands on the frame and then step forward, which will bring the arms slightly posterior. It is essential that the client steps forward rather than leans forward, because leaning would affect the muscles of the neck, back, and hips (Fig. 13).

Figure 6-11 Scalene stretch.

Figure 6-12 Pectoralis minor stretch.

Figure 6-13 Pectoral stretch.

Figure 6-14 Strengthen contralateral scalenes.

Strengthening

If thoracic outlet syndrome is unilateral and the scalenes are involved, remember that the scalenes of one side antagonize those of the other. If the scalenes of the unaffected side are weak, it is important to strengthen them in order to bring the neck back to a neutral position. Resisted rotation toward the affected side will strengthen the scalenes on the unaffected side. This should be performed only if it does not reproduce symptoms on the affected side or cause pain in the posterior neck or shoulder. Instruct the client to rest the palm of the hand on the side of the head with the affected scalenes and rotate the head toward the affected side (Fig. 14).

The client can also strengthen the middle trapezius and rhomboids to reduce protraction of the scapulae. Instruct the client to stand with the arms comfortably hanging at the sides while squeezing the scapulae together (Fig. 15). When this is done properly, only the middle trapezius and rhomboids should contract while the shoulders remain relaxed.

Figure 6-15 Middle trapezius and rhomboid strengthening.

SUGGESTIONS FOR FURTHER TREATMENT

Ideally, a client with symptoms of thoracic outlet syndrome will have treatments twice a week for the first week or two or until symptoms are absent for at least 4 days. This should be followed by weekly treatments until the symptoms are absent for at least 7 days and ROM and strength are restored. As treatment continues, the period

of symptom-free days should increase until the symptoms become occasional or are relieved completely. After this, the client can schedule appointments as necessary. If the thoracic outlet syndrome is caused by muscle tension, the client should have some improvement with each session. If this is not happening, consider the following possibilities:

- There is too much time between treatments. It is always best to give the newly treated tissues 24–48 hours to adapt, but if too much time passes between treatments in the beginning, the client's activities of daily living may reverse any progress.
- The client is not adjusting their activities of daily living or is not keeping up with self-care. As much as we want to fix the problem, we cannot force a client to make the adjustments we suggest.
- The client's thoracic outlet syndrome is advanced or involves other musculoskeletal complications that are beyond your basic training. Refer this client to a massage therapist with advanced clinical or medical massage training. Continuing to treat a client whose case is beyond your training could turn the client away from massage therapy altogether and hinder healing.
- The symptoms have an undiagnosed, underlying cause. Discontinue treatment until the client sees a health care provider for medical assessment.

If you are not treating the client in a clinical setting or private practice, you may not be able to take this client through the full program of healing. Still, if you can bring some relief, it may encourage that client to discuss this change with their health care provider and to consider manual therapy rather than more aggressive treatment options. If the client returns for regular treatments, the symptoms are likely to change each time, so it is important to perform an assessment before each session. As the client's symptoms change, you may be able to focus more of your treatment on a specific area or on other postural imbalances.

Professional Growth

Case Study

Salim is a 53-year-old father of two adult children. He and his brother own a house painting company. In recent months, business has been slow. To reduce expenses, he and his brother have been doing much of the painting themselves. He began feeling numbness and tingling in his hand a few weeks ago and now feels weak when painting. Salim's primary health care provider, Dr. Johnson, practices in an integrative medicine clinic with massage therapists on staff.

SUBJECTIVE

Salim stated that a few weeks ago he started feeling pins and needles in his left hand and noticed that from time to time he cannot feel the object he is holding in that hand, as if the tips of his ring finger and little finger had no sensation. During the past week, he has felt fatigue and weakness in his left shoulder and arm, and now his neck is sore on the right side too. In the beginning the symptoms would appear in the middle of the day, but now they happen almost as soon as he starts to paint and sometimes when he sleeps. Recently, he has been awakened from sleep by the sensation. When asked, Salim answered that he has never noticed any swelling in the arm or hand.

OBJECTIVE

Salim's visit with Dr. Johnson included blood and other tests for systemic conditions, the results of which were negative. Positive Wright and Roos tests suggest thoracic outlet syndrome. Palpation revealed no cervical rib, and no X-ray was ordered. The doctor stated that he believed muscle tension to be the cause

and referred Salim to the massage therapy clinic with the caveat that if symptoms were not reduced after two treatments per week for 2 weeks, he would recommend an MRI. Dr. Johnson saw no need to be conservative or cautious with massage.

Salim stood with most of his weight on his left leg while discussing his symptoms, with his pelvis rotated toward the right. The right hip is slightly flexed and externally rotated. The thorax is laterally flexed left, and the left hip is elevated. The right shoulder is elevated compared to the left. The left scapula is tilted anteriorly. The cervical spine is rotated to the right, laterally flexed to the left. The shoulders are internally rotated bilaterally with increased pronation in the right forearm. Slight scoliosis is evident.

The pectoralis major is dense and adhered bilaterally. Nothing is remarkable in either subclavius. The left pectoralis minor is hypertonic and tender to the touch with taut bands but no referral. Superficial fascial restrictions are present along the lateral neck and into the shoulder. The left scalenes are hypertonic. There is a trigger point in both the anterior and middle scalenes with referred pain into the shoulder. The left latissimus dorsi is adhered and tender. No trigger points were found. The left serratus anterior is dense, and the left side of the ribcage is slightly compressed. There is a trigger point in the serratus anterior with referred pain into the forearm. The right levator scapulae and upper trapezius are hypertonic and tender. There is crepitus around the right superior angle of the scapula. The erector spinae are taut bilaterally along the full spine. The left external obliquus and quadratus lumborum are shortened and hypertonic. The right quadriceps femoris and iliotibial band are thick and adhered. I did not investigate the gluteals or lower limbs; these will be revisited in a subsequent visit.

ACTION

I applied moist heat to the left pectoral area while palpating/assessing tissues around the hips. I moved the heat to the right pectoral area. I performed myofascial release around the glenohumeral joint and across the pectorals bilaterally. With the arm laterally rotated and abducted, I applied effleurage and cross-fiber friction followed by muscle stripping to the pectoralis major, latissimus dorsi, and serratus anterior. I applied trigger point therapy to the serratus. The pain reduced from level 8 to 3 and referral ceased. I applied petrissage to the origin and insertions of the pectoralis minor followed by stripping to the muscle belly. This reproduced symptoms. I returned the client's arm to the neutral position, which eased symptoms, then palpated the pectoralis minor again. No symptoms were reproduced the second time. The pectoralis minor may be too dense to reach trigger points in taut bands. I applied kneading and lengthening strokes to reduce tension, and will attempt to treat trigger points in a subsequent session. I applied a stretch to the pectorals, taking care not to reproduce symptoms. The left scalenes are solid and dense, and the fibers are barely palpable. There are trigger points in the anterior and middle scalene that referred pain across the shoulder but did not reproduce symptoms. I applied cross-fiber friction followed by several rounds of muscle stripping, which reduced referred pain slightly. I used three rounds of brief compression to a trigger point that caused pain at level 7, which then reduced to level 2. I applied general treatment to the upper trapezius, levator scapulae, and neck extensors as well as to the arms bilaterally. In the prone position, I applied general deep tissue massage to the upper back with minor attention to the low back and hips, primarily attempting to lengthen the left latissimus dorsi, abdominals, and quadratus lumborum and to reduce the flexion of the thorax.

The client remained very relaxed throughout the session, seemingly on the verge of sleep if not for my questions regarding symptoms. He stated that he felt looser but a little sore in the pectoral area.

PLAN

I recommended taking time throughout that day to mobilize the neck and arm within his comfort level, in positions other than the one(s) he uses while painting. For example, I suggested that he slowly rotate the

neck from left to right and bring the ear to the shoulder on both the left and right sides. I demonstrated stretches for pectorals and scalenes and those needed to reduce flexion in the thorax. I demonstrated strengthening for the shoulder retractors and lateral rotators of the shoulder. The client will return for treatment in 3 days and keep an account of symptoms during that time.

As Salim's condition improves and he becomes more able to perform activities of daily living without symptoms, I will focus attention on deviations in his hips and spine that may be contributing to the imbalance in the upper body. I will assess legs, knees, and ankles at that time.

CRITICAL THINKING EXERCISES

1. Develop a 10-minute stretching and strengthening routine for a client covering all of the muscles commonly involved in thoracic outlet syndrome. Use Box 6-1 and Figure 6-4 as a guide. Remember that a stretch increases the distance between the origin and insertion of a muscle and is important for those muscles that are shortened while strengthening is performed by actively bringing the origin and insertion closer together and is important for the antagonists of shortened muscles and otherwise weakened muscles. Describe each step of the routine in sufficient detail that the client can perform it without your assistance.
2. Sometimes an assessment reveals signs and symptoms that differ from the average presentation for a client with thoracic outlet syndrome. The following is a list of possible findings. For each, discuss how or why a client may have developed the imbalance, and how the treatment plan should be adapted:
   - Drooped shoulder on the affected side
   - Elevated shoulder on the affected side
   - Trigger point in the scalenes on the unaffected side, with referred pain, but no other symptoms
   - Lateral flexion of the thorax with internal rotation of the shoulder on the affected side, without scoliosis
   - Symptoms when carrying heavy objects with the arms hanging, no symptoms when raising the arm above the head
   - Previous injury to the shoulder on the unaffected side
3. Your client first had symptoms of numbness, tingling, and weakness in the right arm 6 years ago. Following 2 years of treatment including pharmaceutical injections in the scalenes, oral medications, and 6 months of physical therapy intended to strengthen the muscles of the chest and shoulder, the client had no long-term relief. Ultimately, the client was diagnosed with thoracic outlet syndrome and, after another year of medication and physical therapy with no long-term relief, had decompression surgery that involved dividing the anterior scalene and removing a portion of the first rib. The client had considerable relief, but from time to time, particularly when reaching for something, the tingling would return. Over the past 3 months, the symptoms have worsened. Discuss possible reasons why the injections, physical therapy, and surgery were not successful treatments for the client's symptoms, and explain how manual therapy planned according to a current assessment may reduce the client's symptoms.
4. Discuss special considerations and adjustments to treatment for a client who has been diagnosed with a condition such as hypertension or atherosclerosis that is currently under control and being monitored by a health care provider.
5. Discuss how stress might contribute to the symptoms of thoracic outlet syndrome. Consider possibilities that include nerve conduction, muscle tension, diet and exercise, and life outlook. Knowing that a stressed client will see you for 6 treatments over the course of 4 weeks, plan treatment that takes the client's stress into consideration.

BIBLIOGRAPHY AND SUGGESTED READINGS

American Academy of Family Physicians. Management of Shoulder Impingement Syndrome and Rotator Cuff Tears. Available at http://www.aafp.org/afp/980215ap/fongemie.html. Accessed Fall 2008.

American Academy of Orthopaedic Surgeons. Shoulder Impingement. Available at http://orthoinfo. aaos.org/topic.cfm?topic□a00032. Accessed Fall 2008.

Balakatounis K, Angoules A, Panagiotopoulou K. Conservative treatment of thoracic outlet syndrome (TOS): Creating an evidence-based strategy through critical research appraisal. Current Orthopaedics. 2007;21(6):471–476.

Barnes JF. Myofascial release in treatment of thoracic outlet syndrome. Journal of Bodywork and Movement Therapies. 1996;1(1):53–57.

Hamm M. Impact of massage therapy in the treatment of linked pathologies: Scoliosis, costovertebral dysfunction, and thoracic outlet syndrome. Journal of Bodywork and Movement Therapies. 2006;10(1):12–20.

Lindgren K-A. Conservative treatment of thoracic outlet syndrome: A two-year follow-up. Archives of Physical Medicine & Rehabilitation. 1997;78(4):373–378.

Mayo Foundation for Medical Education and Research. Raynaud's Disease. Available at http://www. mayoclinic.com/health/raynauds-disease/DS00433. Accessed Fall 2008.

,Mayo Foundation for Medical Education and Research. Thoracic Outlet Syndrome. Available at http://www.mayoclinic.com/health/thoracic-outlet-syndrome/DS00800. Accessed Fall 2008.

McKenzie K, Lin G, Tamir S. Thoracic outlet syndrome Part I: A clinical review. Journal of the American Chiropractic Association. 2004;41:17–24.

National Institute of Neurological Disorders and Stroke. Complex Regional Pain Syndrome Fact Sheet. Available at http://www.ninds.nih.gov/disorders/reflex_sympathetic_dystrophy/detail_reflex_ sympathetic_dystrophy.htm#105993282. Accessed Fall 2008.

National Institute of Neurological Disorders and Stroke. NINDS Thoracic Outlet Syndrome Information Page. Available at http://www.ninds.nih.gov/disorders/thoracic/thoracic.htm. Accessed Fall 2008.

National Pain Foundation. Thoracic Outlet Syndrome General Information. Available at http://www.nationalpainfoundation.org/cat/871/thoracic-outlet-syndrome. Accessed Fall 2008.

Peng J. 16 cases of scalenus syndrome treated by massage and acupoint-injection. Journal of Traditional Chinese Medicine. 1999;19(3):218–220.

Rattray F, Ludwig L. *Clinical Massage Therapy: Understanding, Assessing and Treating over 70 Conditions*. Toronto ON:, Talus Incorporated, 2000.

Reflex Sympathetic Dystrophy Syndrome Association. About CRPS. Available at http://www.rsds. org/2/what_is_rsd_crps/index.html. Accessed Fall 2008.

Spine Universe. Spinal Stenosis: Lumbar and Cervical. Available at http://www.spineuniverse.com/displayarticle.php/article209.html. Accessed Fall 2008.

Turchaninov R. *Medical Massage*, 2nd ed. Phoenix, AZ: Aesculapius Books, 2006.

U.S. National Library of Medicine and the National Institutes of Health. Cervical Spondylosis. Available at http://www.nlm.nih.gov/MEDLINEPLUS/ency/article/000436.htm. Accessed Fall 2008.

U.S. National Library of Medicine and the National Institutes of Health. Herniated disk. Available at http://www.nlm.nih.gov/medlineplus/ency/article/000442.htm. Accessed Spring 2008.

U.S. National Library of Medicine and the National Institutes of Health. Hypothyroidism. Available at http://www.nlm.nih.gov/medlineplus/ency/article/000353.htm. Accessed Spring 2008.

U.S. National Library of Medicine and the National Institutes of Health. Thoracic Outlet Syndrome. Available at http://www.nlm.nih.gov/medlineplus/thoracicoutletsyndrome.html. Accessed Fall 2008.

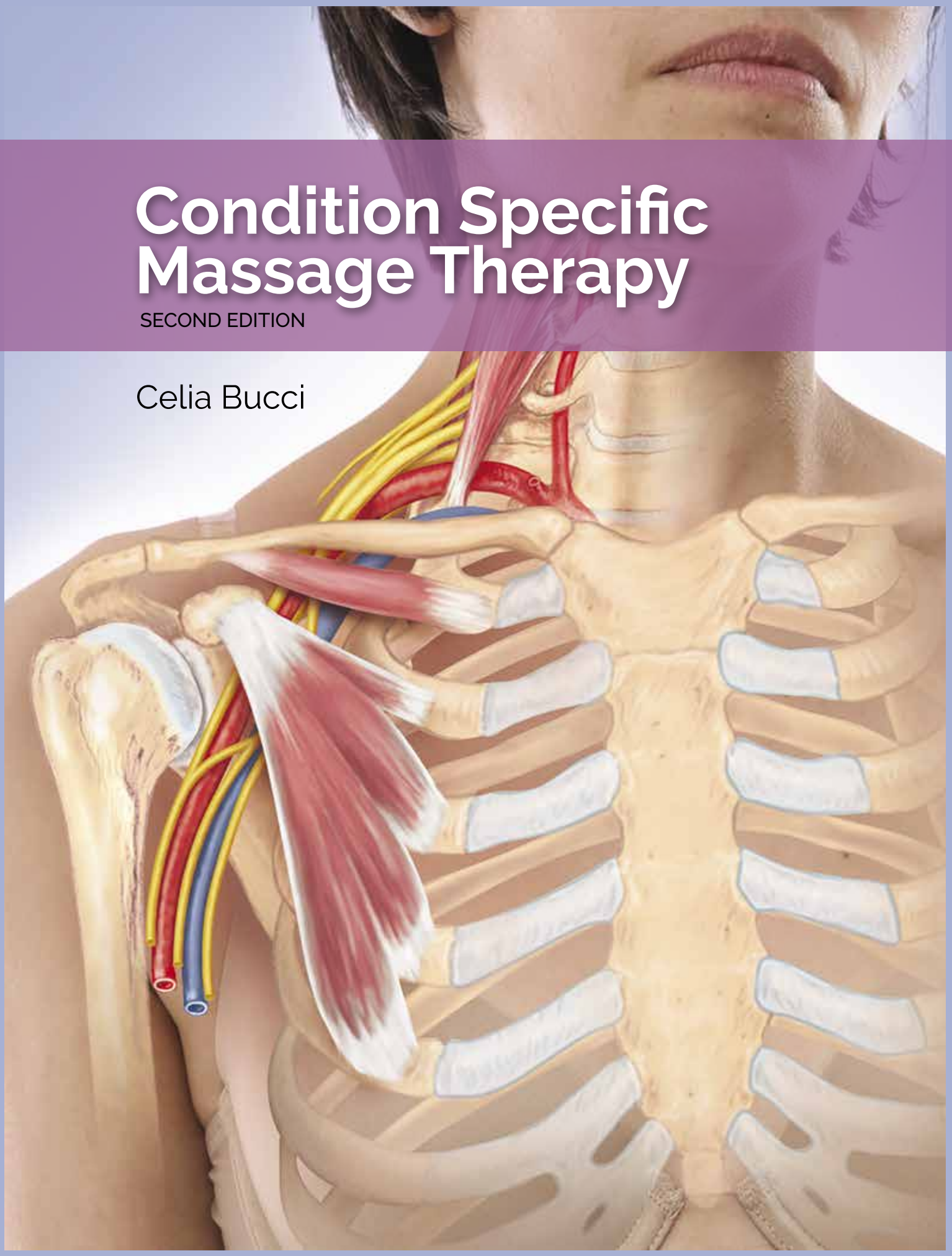
U.S. National Library of Medicine and the National Institutes of Health. TMJ Disorders. Available at http://www.nlm.nih.gov/medlineplus/ency/article/001227.htm. Accessed Fall 2008.

U.S. National Library of Medicine and the National Institutes of Health. Tumor. Available at http://www. nlm.nih.gov/MEDLINEPLUS/ency/article/001310.htm. Accessed Fall 2008.

Condition Specific Massage Therapy

SECOND EDITION

Celia Bucci



Chapter 7:

Carpal Tunnel Syndrome

Carpal Tunnel Syndrome

Understanding Carpal Tunnel Syndrome

Carpal tunnel syndrome occurs when the median nerve is compressed within the carpal tunnel of the wrist. The carpal tunnel is a small space in the wrist between the carpal bones and the flexor retinaculum (also referred to as the transverse carpal ligament) (Fig. 1). The four tendons of flexor digitorum superficialis, the four tendons of flexor digitorum profundus, the tendon of flexor pollicis longus, the ulnar and radial arteries, and the median nerve pass comfortably through this space when the structure and its contents are healthy. When the tissues become inflamed or adhered, or if the structure and its contents are otherwise compromised, the amount of space in the tunnel is reduced and the nerve and the blood vessels may become compressed. Compression of the median nerve slows the impulses transmitted, which results in pain, numbness, and tingling along its distribution. Compression of the blood vessels may reduce circulation, affecting the health and function of the nerve and other tissues nourished by compromised vessels. Movement of the wrist and hand frequently intensifies the symptoms. A client diagnosed with carpal tunnel syndrome often wears a splint to keep the wrist immobilized in an attempt to reduce symptoms.

The carpal tunnel is not the only place where compressed nerves and vessels may result in similar symptoms. The roots of the brachial plexus exit the spine between C5 and T1. These five roots merge, divide, and merge again to form three cords. The median nerve arises from the medial and lateral cords. The nerve wraps around to the front of the neck, travels under the lateral clavicle, passes beneath the coracoid process, and follows down the anterior, medial arm, through the middle of the cubital fossa and forearm, through the

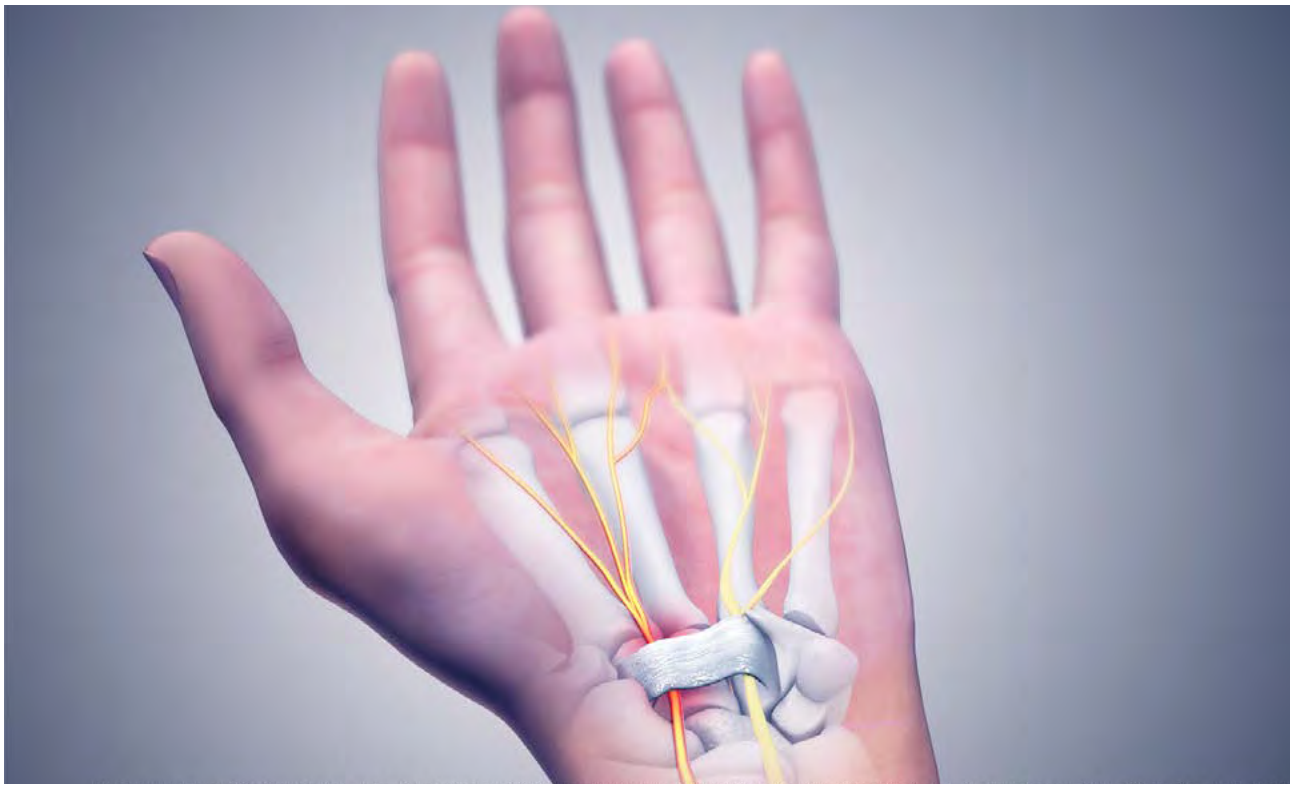


Figure 7-1 The Carpal Tunnel

Image Credit: www.scientificanimations.com-http://www.scientificanimations.com/wiki-images/, CC BY_SA 4.0 https://commons.wikimedia.org/w/index/php?curid=78385033

carpal tunnel, and into the palm (Fig. 2). Because postures and activities that commonly contribute to carpal tunnel syndrome may also involve the elbow, shoulder, and neck, symptoms can be intensified by compression of the nerve at more than one location. This is referred to as "double crush," a condition in which innervation is interrupted at more than one site along the path of a nerve. Trauma, tension, and trigger points in the scalenes, pectoralis minor, or pronator teres can cause similar pain, tingling, and numbness. It is always best to allow time in your treatment to at least superficially treat the whole neck and arm on the affected side.

Muscles innervated by the median nerve include:

- Flexor carpi radialis
- Flexor digitorum superficialis
- Flexor digitorum profundus
- Flexor pollicis brevis
- Flexor pollicis longus
- Palmaris longus
- Pronator teres
- Pronator quadratus
- Opponens pollicis
- Abductor pollicis brevis
- 1st and 2nd lumbricals of the hand

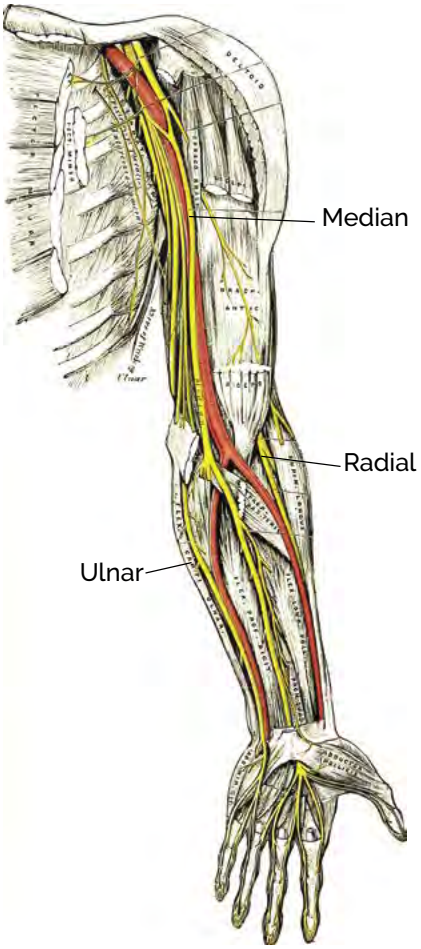


Figure 7-2 Path of the Median Nerve
Image Credit: Gray, Henry, 1825-1861;Carter, H. V. (Henry Vandyke), 1831-1897;Pick, T. Pickering (Thomas Pickering), 1841-1919, No restrictions, via Wikimedia Commons

COMMON SIGNS AND SYMPTOMS

Carpal tunnel syndrome usually begins gradually with pain, numbness, and/or tingling in the thumb, index and middle fingers, lateral half of the ring finger, wrist, and palm of the hand (Fig. 3). In the early stages, these symptoms typically occur with movement, especially repetitive movements that cause friction to the structures and increase inflammation, or when the wrist is held in a flexed position for a long time, increasing pressure in the tunnel. Symptoms usually occur in the dominant hand because it is more likely subjected to greater stress but can also occur in the nondominant hand, especially if the nondominant hand has been subjected to trauma or over use, and can occur in both hands. Sleeping with the wrists flexed can intensify symptoms, often waking the person. Disturbed sleep may then become a contributing factor in the progression of the syndrome, possibly contributing to anxiety and depression, which may in turn increase the symptoms. As the syndrome progresses, the client may experience symptoms during the day, with or without movement. With reduced innervation the muscles become weaker, making it difficult to grasp items like a cup or a pen or to

Figure 7-3 Carpal Tunnel Symptoms
Image Credit: Joel Bubble Ben/Shutterstock

perform other fine motor skills. Pain begins to travel up the arm and often reaches the shoulder and neck. Ultimately, the thenar muscles may atrophy and the client may begin to lose sensation in the hand, making it difficult to sense temperature or other normally painful stimuli. Each client may experience this progression differently, with symptoms developing over the course of weeks, months, or years depending on the contributing factors and the client's general health. The further the syndrome progresses, the greater the chance that the nerve itself will become damaged and the muscles innervated by it will lose tone and strength. Therefore, it is important for someone suffering from even mild symptoms of carpal tunnel syndrome to get treatment as soon as possible.

POSSIBLE CAUSES AND CONTRIBUTING FACTORS

Carpal tunnel syndrome does not have a single primary cause, although certain factors commonly contribute. The minimal space in the tunnel can be reduced by an anatomical variation, bone dislocation, abnormal growth of bone, a cyst, a tumor, or another obstacle. Though massage therapy may reduce the discomfort caused by such obstacles, it cannot eliminate them. Carpal tunnel syndrome may also occur when soft tissues within the tunnel increase in size or change shape because of acute injury, scarring, fibrotic tissue buildup, inflammation, hypertonicity, trigger points, tendinopathy, sprains, and strains. Likewise, the flexor retinaculum may become larger or inflamed because of injury or because adhered tissues increase the amount of friction that occurs with movement. Friction is a common cause of inflammation.

Clients whose activities of daily living include repetitive or forceful actions or vibrations at the wrist are prone to developing carpal tunnel syndrome. Careers in which employees have a high rate of carpal tunnel syndrome include data entry, assembly, meat or fish packing, construction, electrical work, hair styling, driving, and any other job that involves forceful, repetitive actions or that keeps the wrist in flexion for long periods. Unless acute injury is the primary contributing factor, when the cause of carpal tunnel syndrome is neuromuscular, the client may not feel symptoms until long after the contributing postures or activities have become part of their activities of daily living. Similarly, once treatment reduces symptoms, the client must diligently address contributing factors to avoid recurrence.

Other factors associated with nerve impairment include obesity, hypothyroid condition, arthritis, diabetes, gout, hormonal changes, lymphedema, rheumatoid arthritis, lupus, and Lyme disease. In these cases, the symptoms may quickly resolve once the associated condition is controlled. During pregnancy, body fluids increase and may contribute to compression, though this is likely to resolve shortly after childbirth. Cigarette smoking, though not a cause of carpal tunnel syndrome, exacerbates the inflammatory process and can intensify symptoms. Alcoholism, poor nutrition, vitamin B deficiency, and general stress may also contribute. Some evidence suggests that genetics may also play a role in carpal tunnel syndrome. Bone structure, abnormal collagen production, and abnormal myelin regulation are genetic factors that may predispose a client to the syndrome. Symptoms are likely to arise in these individuals in adolescence and are more likely to be bilateral.

Because so many factors can contribute to peripheral neuropathies, be sure to understand the client's health history before proceeding with treatment. Many of the conditions listed above have contraindications for massage therapy or require adjustments to treatment. Moreover, when a systemic condition contributes to a peripheral neuropathy, especially if that systemic condition is not being monitored by a health care provider, massage therapy alone may bring only temporary relief of symptoms. Refer the client to their health care provider if you suspect a systemic condition or obstruction in the wrist, and discuss treatment with the client's health care provider if such a condition has been diagnosed. Table 1 lists conditions commonly confused with, or that contribute to carpal tunnel syndrome.

Table 7-1: Differentiating Conditions Commonly Confused with or Contributing to Carpal Tunnel Syndrome

CONDITION	TYPICAL SIGNS & SYMPTOMS	TESTING	MASSAGE THERAPY
Herniated disc	Symptoms may increase when coughing, laughing, and straining	Kemp's test Spurling's test CT scan Myelography MRI	Massage is indicated with caution and proper training. Acute inflammation and acute injury are contraindications. Work with the health care team.
C4-5	Weak deltoid Shoulder pain Usually no radiating pain or paresthesia		
C5-6	Weak biceps and wrist extensors Pain and paresthesia in radial distribution		
C6-7	Weak triceps and finger extensors Pain and paresthesia down posterior arm into third digit		
C7-T1	Weak hand grip Pain and paresthesia in ulnar distribution		
Thoracic outlet syndrome	Pain in neck, shoulder, chest, arm, and hand Swelling, vascular changes, weakness or clumsiness in arm and hand Paresthesia in ulnar nerve distribution	Adson's test Travell's variation Scalene cramp test Eden's test Wright's hyperabduction Pectoralis minor test Upper limb tension test	See Thoracic Outlet Syndrome
Pronator teres syndrome	Symptoms can be identical to Carpal tunnel syndrome Pain in forearm—worsened by elbow flexion/extension Absence of pain at night	Resisted pronation of forearm (excluding resistance to wrist) Tinel's sign at the median nerve as it passes under pronator teres	Massage is indicated
Tendinopathy	Local inflammation and point tenderness	Pain on full, passive stretch of joint that tendon crosses; pain with resisted activity	See Tendinopathy
Bursitis	Heat and swelling at joint Pain with active and passive movement of joint	Physical examination	Contraindicated locally, peripheral treatment may increase ROM.
Cubital tunnel syndrome	Numbness, pain, paresthesia, or weakness in the ulnar nerve distribution	Symptoms proximal to wrist Tinel's sign at cubital tunnel	Massage is indicated with caution to the area at the elbow where the ulnar nerve is most superficial.
Osteoarthritis	Stiff, painful joints Usually affects more than one joint	Physical examination	Massage is indicated when no acute symptoms are present.

Table 7-1: Differentiating Conditions Commonly Confused with or Contributing to Carpal Tunnel Syndrome (continued)

CONDITION	TYPICAL SIGNS & SYMPTOMS	TESTING	MASSAGE THERAPY
Hypothyroid condition	Weakness, fatigue, intolerance to cold, constipation, unintentional weight gain, brittle hair and nails, dry skin, puffy skin, hoarse voice	Physical examination T3, T4, and serum thyroid-stimulating hormone laboratory tests	Massage is indicated when no other contraindicated condition, such as circulatory complication, is present.
Gout	Red, hot, swollen joints Extreme pain Sudden onset	Physical examination X-ray Synovial fluid test Uric acid blood and urine tests	Massage is contraindicated during acute attacks. Gout may indicate other systemic conditions. Work with health care team.
Lupus	Skin rash Ulcers in mouth, nose, or throat Painful joints Headaches Kidney and nervous system disorders	Physical examination Diagnosis is complex Assessment includes presence of symptoms; blood, kidney, urine tests; chest x-ray; ECG	Massage is contraindicated during flare-ups. Work with health care team.
Lyme disease	Circular, bull's eye rash Red, itchy skin Fever Fatigue Joint pain Irregular heartbeat	Physical examination Assessment of symptoms and antibody tests Laboratory tests may be inconclusive in early stage of disease	Massage is indicated in nonacute stages. Work with health care team.
Rheumatoid arthritis	Fatigue, loss of appetite, low-grade fever, bilateral nonspecific muscle pain, rheumatic nodules, periods of flares and remission	Physical examination Blood tests Radiography	Massage is indicated in nonacute stages. Work with health care team.
Diabetes	Frequent urination, frequent thirst, increased appetite, fatigue, nausea	Physical examination Fasting blood sugar test	Massage is indicated when tissues and circulation are not compromised.

CONTRAINDICATIONS AND SPECIAL CONSIDERATIONS

It is essential to understand the factors contributing to carpal tunnel syndrome. If a systemic condition or structural abnormality is present, work with the client's health care provider and consult a pathology text for massage therapists before proceeding. Following are a few general cautions and contraindications:

- **Underlying pathologies.** The signs and symptoms of carpal tunnel syndrome may result from a wide variety of underlying conditions. If you suspect one of these (consult Table 1 and your pathology book for signs and symptoms), refer the client to their health care provider for medical assessment before initiating treatment. If the client is diagnosed with an underlying pathology that is not a contraindication for massage, work with the health care provider when necessary to develop an appropriate treatment plan.

- **Acute injury.** If the client has an acute injury, PRICE (protection, rest, ice, compression, elevation) is the protocol. You may work conservatively proximal to the site but avoid the wrist, hand, fingers, and any other area affected by the injury until it is in the subacute or chronic stage.
- **Edema.** If edema is present, do not work directly on the site. Work proximally, moving the fluid toward the nearest proximal lymph nodes. If vascular compression is a consideration but massage is not contraindicated for the client, do not allow the arm to fall below the heart because gravity may draw fluid into the arm and hand. Bolster the arm if necessary to keep fluid from accumulating.
- **Friction.** Do not use deep frictions if the client has a systemic inflammatory condition such as rheumatoid arthritis or osteoarthritis, if the health of the underlying tissues is compromised, or if the client is taking an anti-inflammatory medication. Friction creates an inflammatory process, which may interfere with the intended action of the anti-inflammatory medication. Recommend that your client refrain from taking such medication for several hours prior to treatment if their health care provider is in agreement.
- **Mobilizations.** Be cautious with mobilizations if the client has degenerative disc disease, rheumatoid arthritis, a bony obstruction, hypermobile joints, or if ligaments are unstable due to injury, pregnancy or a systemic condition.
- **Pressure points.** Because pressure points in the hand may induce labor, avoid these in pregnant women.
- **Reproducing symptoms.** Symptoms may occur during treatment if you manually compress the nerve or if the client's posture causes structures to compress the nerve. If treatment reproduces symptoms, first adjust the client's posture to relieve compression. If this does not relieve the symptoms, reduce your pressure or move away from the area. You may be able to treat around the site that reproduced the symptoms, but work with caution.
- **Hydrotherapy.** Do not use heat in areas of edema or inflammation because heat dilates vessels and may increase the accumulation of fluid. Do not use moist heat on the neck or chest if the client has a cardiovascular condition that may be affected by dilation of blood vessels. Severe hypertension and atherosclerosis are two examples. Consult your pathology book for recommendations.
- **Initiating inflammatory process.** If treatment causes inflammation, end with cool hydrotherapy to inhibit the inflammatory process.

MASSAGE THERAPY RESEARCH

In 2004, Field et al. published a study titled "Carpal Tunnel Syndrome Symptoms Are Lessened Following Massage Therapy." The study involved 16 adults between the ages of 20 and 65 years, of middle socioeconomic status and varied ethnicity. Each participant had been previously diagnosed with carpal tunnel syndrome, worked extensively at a computer, and had unilateral symptoms at the time. The participants were divided randomly into a group that received massage therapy and a group that did not. Those in the massage group received a 15-minute massage to the affected arm once per week for 4 weeks. These participants were also taught self-massage and were instructed to perform it daily before bedtime. The control group received no massage but was taught self-massage after the study was completed. The study's results showed that the group receiving massage had significantly reduced symptoms, increased strength, increased nerve conductivity, and decreased anxiety and depression. The control group showed little change. The study's authors concluded that massage therapy has demonstrable benefits in the treatment of carpal tunnel syndrome. The study further notes that although carpal tunnel release surgery is successful in 75% of cases, complications including injury to the median nerve, scarring, loss of motion, and infection may occur, and symptoms recur in up to 19% of cases.

In 2007, Burke et al. published a study titled "A Pilot Study Comparing Two Manual Therapy Interventions for Carpal Tunnel Syndrome." This study compared the benefits of soft tissue manipulation conducted with the therapist's hands (STM group) to the benefits of manipulation conducted with patented tools used in the Graston Technique (GISTM group). The study involved 22 patients with carpal tunnel syndrome randomly divided into the two groups. On average, each participant received treatment twice per week for 4 weeks, then once per week for 2 weeks. Participants in both groups were treated by the same clinician who was trained in both techniques. Evaluations were made within 1 week of the final treatment, 6 weeks after last treatment, and 3 months after treatment. Although the clinical findings were not significantly different between the STM and GISTM groups, the study showed evidence that manual therapy increased ROM and grip strength in wrists affected by carpal tunnel syndrome. The authors of the study reported that these findings suggest that manual therapy may increase myofascial mobility, increase blood flow, and reduce ischemia, in turn alleviating symptoms of carpal tunnel syndrome.

In 2008, Moraska et al. published a study titled "Comparison of a Targeted and General Massage Protocol on Strength, Function, and Symptoms Associated with Carpal Tunnel Syndrome: A Randomized Pilot Study." In this study, 27 subjects previously diagnosed with carpal tunnel syndrome were randomly assigned to receive 30 minutes of either targeted or general massage therapy twice weekly for 6 weeks. The general protocol was typical of general relaxation massage intended to reduce tension and increase circulation to the back, neck, and both arms. The targeted protocol focused on sites of entrapment of the median nerve by reducing inflammation, adhesions, and hypertonicity along the full course of the brachial plexus and median nerve. Assessments were made at the beginning of the 8th and 12th treatments, and outcome assessments including strength and function were made 2 days after the 7th and 11th sessions. Both groups showed improvement in symptoms, but only the group receiving targeted treatment showed improvement in grip strength. The study's authors concluded that massage therapy may be effective in treating compression neuropathies including carpal tunnel syndrome.

Working With the Client

CLIENT ASSESSMENT

Assessment begins at your first contact with a client. In some cases, this may be on the telephone when an appointment is requested. Ask whether the client is seeking treatment for specific symptoms so that you can review or research treatment options and contraindications to prepare yourself for the session. Table 2 lists questions to ask the client when taking a health history.

Table 7-2: **Health History**

QUESTIONS FOR THE CLIENT	IMPORTANCE FOR THE TREATMENT PLAN
Where do you feel symptoms?	Location of symptoms gives clues to location of compression, trigger points, injuries, or other contributing factors.
Describe what your symptoms feel like.	Differentiate possible origins of symptoms. Nerve compression often results in numbness and tingling along the distribution of that nerve.
Do any movements make the symptoms worse or better?	Locate tension, weakness, or compression in structures producing such movements.
Have you seen a health care provider for this condition? What was the diagnosis? What tests were performed?	If no tests were performed by the health care provider making a diagnosis, use the tests described later in this chapter for your assessment. If your assessment is inconsistent with the diagnosis, ask the client to discuss your findings with their health care provider, or ask for permission to contact their provider directly.

Table 7-2: **Health History (continued)**

QUESTIONS FOR THE CLIENT	IMPORTANCE FOR THE TREATMENT PLAN
Have you been diagnosed with a condition such as diabetes, hypo- or hyperthyroid condition, rheumatoid arthritis or osteoarthritis, or systemic lupus?	Systemic conditions may contribute to symptoms, may require adjustments to treatment, and may impact treatment outcomes.
Are you pregnant?	Increased body fluid during pregnancy may contribute to symptoms that resolve after childbirth.
Have you had an injury or surgery?	Injury or surgery and resulting scar tissue may cause adhesions, hyper- or hypo-tonicity, trigger points, atypical ROM, and the signs and symptoms of carpal tunnel syndrome.
What type of work, hobbies, or other regular activities do you do?	Repetitive motions and static postures may contribute to the client's condition.
Are you taking any prescribed medications or herbal or other supplements?	Medications of all types may contribute to symptoms or involve contraindications or cautions.
Have you had a cortisone shot in the past 2 weeks? Where?	Local massage is contraindicated.
Have you taken a pain reliever or muscle relaxant within the past 4 hours?	The client may not be able to judge your pressure.
Have you taken anti-inflammatory medication within the past 4 hours?	Deep friction may initiate an inflammatory process and should not be performed if the client has recently taken an anti-inflammatory medication.

Postural Assessment

Allow the client to walk into the room ahead of you while you assess posture and gait. Look for imbalances or patterns of compensation. If you suspect carpal tunnel syndrome, have the client turn the doorknob to enter the room or pick up a pen or a cup of water without making them aware that you have begun your assessment. Do not hand the object to the client, but have the client pick it up himself or herself. If the client performs the task with the unaffected hand, especially if that hand is their nondominant hand, this could indicate a compensation pattern due to weakness in the affected hand. A client whose symptoms originate from compression superior to the carpal tunnel is not as likely to lose motor function of the hand unless the condition has existed for a long time without treatment. This client may, however, compensate because of pain.

Because the symptoms of carpal tunnel syndrome are often confused with symptoms from compressions occurring elsewhere in the body, it is important to assess the client in the posture most common in their activities of daily living or in the posture or activity that produces symptoms. For example, if your assessment of the standing client reveals exaggerated internal rotation at the shoulder, this could indicate compression of the brachial plexus at the pectoral area. If your assessment of the seated client reveals an exaggerated kyphotic curve with head forward and neck extended, it is possible that the nerve compression begins at the neck, specifically at the scalenes. If you suspect that a client's posture indicates contributing or compensating factors, treat these as much as time and the client's tolerance permit. Figure 4 compares the anatomical position to the posture affected by carpal tunnel syndrome.

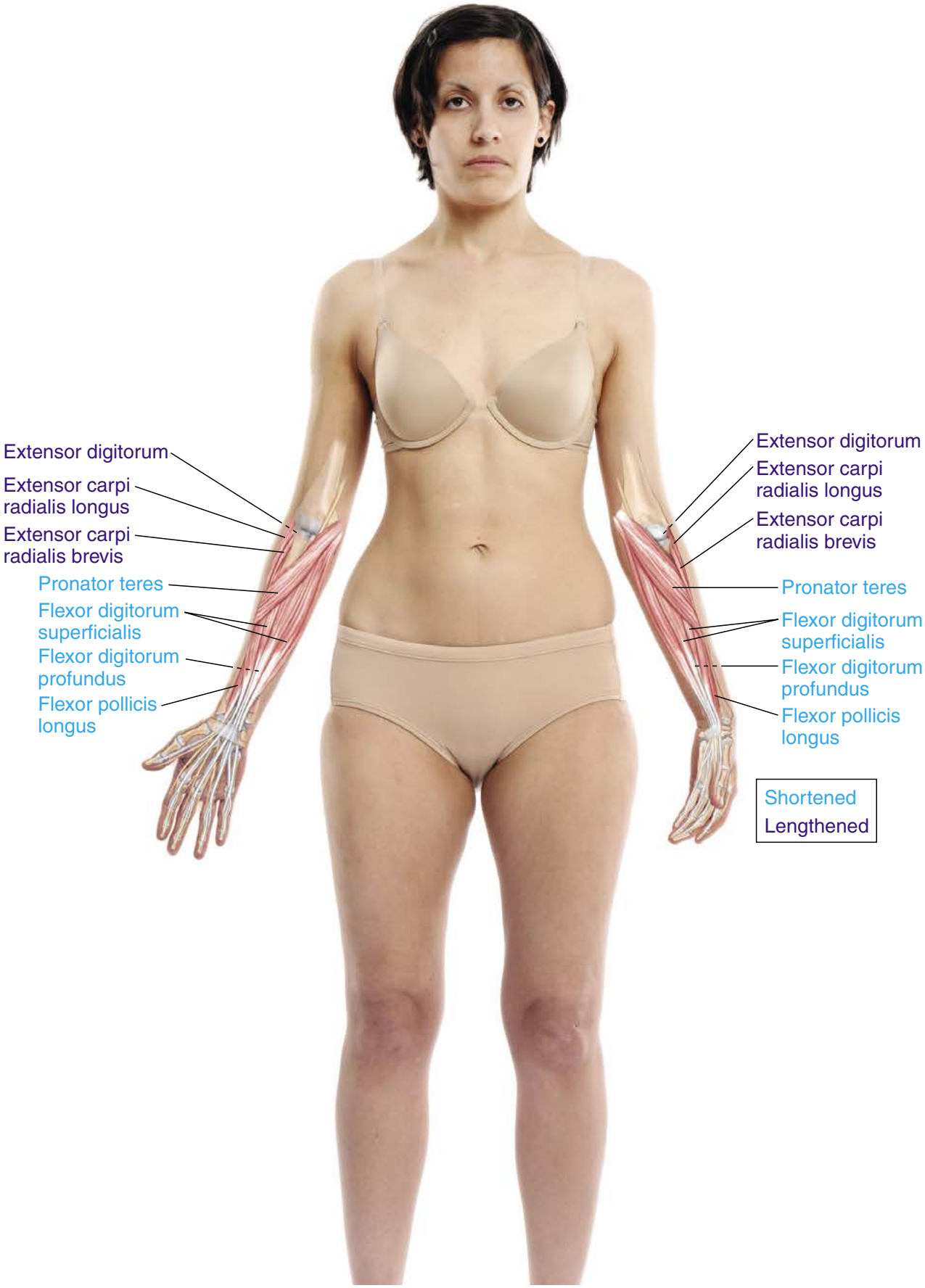


Figure 7-4 Note how the shortened flexors may contribute to compression of the contents in the carpal tunnel

Box 7-1: Average Active ROM for Joints Involved in Carpal Tunnel Syndrome

Elbow

Flexion 140–150˚
- Biceps brachii
- Brachialis
- Brachioradialis
- Flexor carpi radialis
- Flexor carpi ulnaris
- Palmaris longus
- Pronator teres
- Extensor carpi radialis longus
- Extensor carpi radialis brevis

Extension 0˚ (5–10˚ Hyperextension)
- Triceps brachii
- Anconeus

Radioulnar Joint (Forearm)

Pronation 80–90˚
- Pronator teres
- Pronator quadratus
- Brachioradialis

Supination 80–90˚
- Biceps brachii
- Supinator
- Brachioradialis

Wrist

Flexion 80–90˚
- Flexor carpi radialis
- Flexor carpi ulnaris
- Palmaris longus
- Flexor digitorum superficialis
- Flexor digitorum profundus

Extension 65˚
- Extensor carpi radialis longus
- Extensor carpi radialis brevis
- Extensor carpi ulnaris
- Extensor digitorum

Adduction (Ulnar Deviation) 30˚
- Extensor carpi ulnaris
- Flexor carpi ulnaris

Abduction (Radial Deviation) 20˚
- Extensor carpi radialis longus
- Extensor carpi radialis brevis
- Flexor carpi radialis

Fingers 2–5

Flexion 85–90˚
- Flexor digitorum profundus
- Flexor digiti minimi brevis
- Lumbricals
- Some interossei

Extension 30–45˚
- Extensor digitorum
- Extensor indicis
- Lumbricals
- Some interossei

Abduction 20–30˚
- Dorsal interossei
- Abductor digiti minimi

Adduction 0–5˚
- Palmar interossei
- Extensor indicis

Thumb

Flexion 55˚
- Flexor pollicis longus
- Flexor pollicis brevis
- Adductor pollicis

Extension 20˚
- Extensor pollicis longus
- Extensor pollicis brevis
- Abductor pollicis longus

Adduction 30˚
- Adductor pollicis

Abduction 60–70˚
- Abductor pollicis longus
- Abductor pollicis brevis

Opposition (Flexion and Abduction)
- Opponens pollicis
- Flexor pollicis brevis
- Abductor pollicis brevis

Range Of Motion Assessment

Test the range of motion of the elbow, wrist, and fingers, assessing the length and strength of both agonists and antagonists that cross the joints tested. Because the client controls the amount of movement, keeping it within a pain-free range, only active ROM should be used in the acute stage of injury to prevent undue pain or reinjury. Box 1 presents the average active ROM results for the joints involved in carpal tunnel syndrome.

Active ROM

Compare your assessment of the client's active ROM with the ranges in Box 1. Carpal tunnel syndrome symptoms may not be reproduced with active ROM assessment because the client may limit their movement to the symptom-free range.

- **Active flexion of the wrist.** When muscle tension, adhesions, and trigger points contribute to carpal tunnel syndrome, an active, concentric contraction of the wrist flexors may be reduced. The client will likely be resistant to full, active flexion of the wrist if this produces symptoms during activities of daily living.
- **Active extension of the wrist** may be restricted because tight flexors may not allow the full range of extension in the wrist.
- **Active adduction of the wrist** may be restricted if the abductors of the wrist are shortened and hypertonic.

Passive ROM

Compare the client's passive ROM of the affected wrist with that of the unaffected wrist. Note and compare the end feel for each range in both wrists.

- **Passive flexion of wrist.** The client may resist even passive flexion of the wrist if flexion causes pain in daily life. Numbness and tingling may occur with full passive flexion if the space in the carpal tunnel is already reduced by other factors. Pain may be felt at the medial epicondyle of the humerus, on the anterior and medial forearm, and at the wrist itself. A hard end feel may indicate a bony structure as a contributing factor.
- **Passive extension of wrist.** In passive extension, a painful stretch to tight wrist flexors may be felt along the anterior and medial aspect of the forearm and the wrist. Numbness and tingling may occur with full passive extension of the wrist. Pain with full passive extension of the wrist may also suggest tendinopathy of a wrist flexor.
- **Passive extension of elbow.** Pain on a full passive extension of the elbow may indicate tendinopathy of the elbow or wrist flexors.
- **Passive adduction of wrist** may cause a painful stretch if the wrist abductors are shortened and hypertonic.

Resisted ROM

Use resisted tests to assess the strength of the muscles that cross the joints involved. Compare the strength of the affected side with that of the unaffected side.

- **Resisted flexion of the wrist** may produce symptoms as tendons passing through the carpal tunnel shorten and widen, further decreasing space in the tunnel.
- **Resisted extension of the wrist** may reveal weakness. This may result from accumulating tension in the flexors, which may lengthen and weaken the extensors reducing their capacity to oppose flexion.
- **Resisted adduction of the wrist** may reveal weakness if the wrist abductors are shortened and hypertonic.
- **Resisted abduction of the thumb** may also reveal weakness, suggesting that the abductor pollicis brevis is affected.

Special Tests

Phalen's maneuver may reveal median nerve compression in the carpal tunnel. To ensure that the symptoms originate from the carpal tunnel rather than another area along the median distribution, while performing this test the client must not pronate the forearm, internally rotate the shoulder, or put the neck in flexion, lateral flexion, extension, or rotation.

1. Apply full passive flexion to the affected wrist to test for compression of the median nerve at the carpal tunnel (Fig. 5).
2. If symptoms occur within 60 seconds of holding this position, the test is considered positive for median nerve compression with flexion of the wrist.

Figure 7-5 Phalen's maneuver.

Pronator teres test may reveal compression of the median nerve by pronator teres. Note that unlike carpal tunnel syndrome, pronator teres syndrome does not typically involve symptoms that wake the client from sleep. Symptoms are most noted with repetitive or resisted flexion and extension or pronation and supination of the elbow.

1. Begin with the client's elbow passively flexed. Support the elbow with one hand if the client is unable to keep the flexed elbow relaxed. Instruct the client to pronate the forearm against your resistance, then passively extend the elbow to lengthen the contracting pronator teres. (Fig. 6). Apply resistance at the distal forearm instead of the hand to avoid flexion and undue pressure at the wrist and to distinguish between symptoms that originate at pronator teres from those that originate in the carpal tunnel.
2. The test is considered positive for compression of the median nerve under pronator teres if symptoms are reproduced within 60 seconds.

Figure 7-6 Pronator teres test.

Tinel's sign can be used to test nerve conduction anywhere in the body. When testing for carpal tunnel syndrome, ensure that there is no active contraction producing flexion in the wrist, pronation of the forearm, flexion or internal rotation of the shoulder, or lateral flexion, extension, or rotation of the neck to ensure that any reproduced symptoms are originating from the carpal tunnel.

Figure 7-7 Tinel's sign at the carpal tunnel.

1. Tap on the median nerve in the carpal tunnel just distal to the crease of the wrist (Fig. 7).
2. The test is considered positive for carpal tunnel syndrome if the client feels tingling along the median nerve distribution.

Palpation Assessment

Assess the fascia along the full forearm, wrist, and hand. Skin rolling is a useful tool for assessing superficial fascial restrictions. Areas of restriction may be found nearest the attachment sites of the forearm flexors, though restrictions are possible anywhere in the forearm.

At the forearm, you may find that the flexors are shortened and hypertonic and the extensors weak and taut. When the extensors are weak, they cannot oppose flexion of the wrist efficiently, allowing exaggerated flexion to continue or worsen.

Check the temperature, color, and texture of the superficial tissues. Compression of the nerve or the vessels may cause cool or warm skin, pale skin, boggy texture, and even reduced hair growth.

CONDITION SPECIFIC MASSAGE

Because the causes of pain, numbness, and tingling in the wrist and hand vary so widely, it may be difficult to pinpoint a single cause. Moreover, more than one condition may be present at the same time. A client who works at a desk for long periods is likely to sit with the head forward and neck in extension (affecting the scalenes), the shoulder internally rotated (affecting the pectorals), the forearm pronated (affecting the pronator teres), and the wrist and fingers in flexion or extension or moving constantly between these (affecting the contents of the carpal tunnel). Likewise, patterns of compensation for any of these conditions can contribute to symptoms of the others.

It is essential for treatment to be relaxing. You are not likely to eliminate the symptoms of carpal tunnel syndrome, or any of the conditions associated with it, in one treatment. Do not try to do so by treating aggressively. Be sure to ask your client to let you know whether your pressure keeps them from relaxing. If the client responds by tensing muscles or has a facial expression that looks stressed, reduce your pressure. Remember that you are working on tissue that is compromised.

It is also important for the client to let you know whether any part of your treatment reproduces symptoms. Adjust the client to a more neutral position, reduce your pressure, or move slightly off the area if this occurs, and make a note about it as it may help you understand more clearly exactly which neuromuscular conditions are contributing to symptoms. Instruct your client to use deep but calming breathing to help them relax.

If palpation of a trigger point refers pain elsewhere, explain this to your client and ask them to breathe deeply during the technique. As the trigger point is deactivated, the referred pain will also diminish. Common trigger points and their referral patterns are shown in Figure 8.

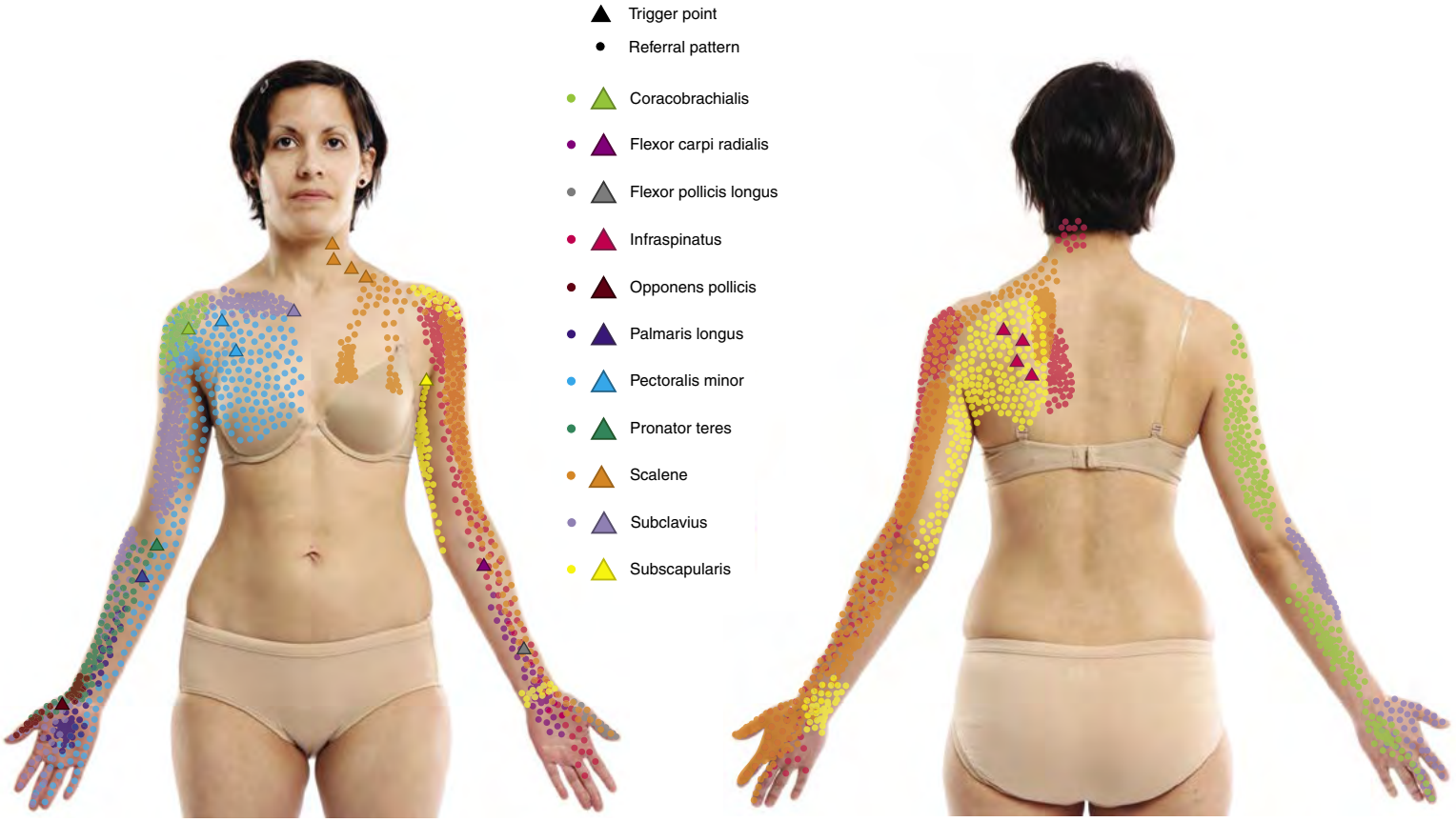


Figure 7-8 Common trigger points with referrals associated with carpal tunnel syndrome.

The following suggestions are for treatment of symptoms including pain, tingling, or numbness due to compression of the median nerve at the carpal tunnel in the chronic stage. If the client has an acute injury, follow the PRICE (protect, rest, ice, compression, elevation) protocol. In this case, you may work conservatively proximal to the site but will have to avoid the injured area until the subacute or chronic stage.

Treatment Goals:

 Increase circulation
 Reduce adhesions
 Reduce tone/ tension
 Lengthen tissue
 Treat trigger points
 Passive stretch
 Clear area

- Begin in the supine position and initiate treatment on the affected side. If the affected side is too painful to approach, beginning with the unaffected side may help the affected side to relax. If both arms are affected, begin with the dominant side.

- If inflammation is present, bolster the arm so that gravity encourages venous return and the draining of fluid toward the proximal lymph nodes.
- If you suspect a double crush that involves compression of the brachial plexus at the neck or the pectoral area, refer to thoracic outlet syndrome chapter for suggestions for treating thoracic outlet syndrome.

- Assess the arm for adhesions and hypertonicity. The muscles of the arm may be compensating because of pain or weakness in the forearm and hand. If you find nothing remarkable, be conservative in your treatment of the upper arm to spare time. You can come back to this in a subsequent treatment once you have attended to the major contributing factors.

- Assess the wrist flexors for adhesions. Begin with the most superficial muscles and progress to the deepest. Reduce any adhesions found.

- Assess and treat the wrist flexors for hypertonicity. Beginning again with the most superficial tissues and progressing to the deepest, release tension in the wrist flexors.

- Lengthen the individual muscles whose tendons pass through the carpal tunnel. These muscles include the flexor digitorum superficialis, flexor digitorum profundus, and flexor pollicis longus. You may also find the other flexors flexed and shortened. Treat these if indicated. Follow the length of these fibers from origin to insertion to comprehensively assess and lengthen them.

- Assess the pronator teres for hypertonicity and trigger points because it is a common area for median nerve compression.

- Treat trigger points found in the wrist flexors and apply a passive stretch.

- Assess the flexor retinaculum for adhesions and release them if found. Be sure to work within the client's pain tolerance and to lighten your pressure or discontinue this technique if it reproduces symptoms. It may be necessary to wait until a subsequent treatment to use this technique. As the client's symptoms are reduced with each treatment, the pressure at the carpal tunnel may diminish, allowing for more aggressive treatments such as friction.


- Find the attachments of the flexor retinaculum at the pisiform, hamate, scaphoid, and trapezium. Apply lengthening strokes in the direction of the fibers of the retinaculum. Follow this with a gentle stretch to the retinaculum by pinning the tissue at its attachments and gently pulling them away from each other (Fig. 9). To avoid repeated injury, be careful not to overstretch a ligament, especially if the client has a history of trauma.

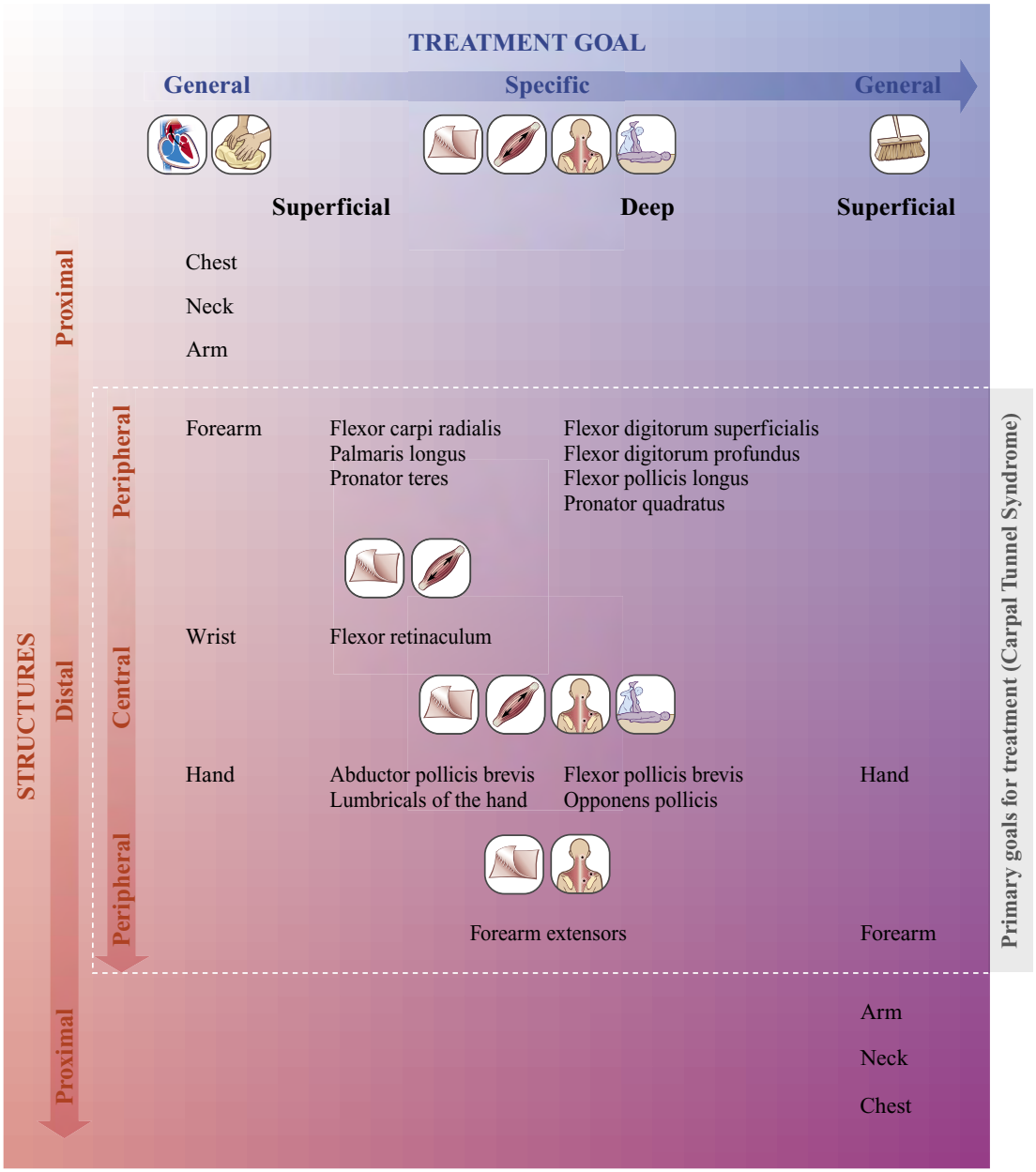
- If the client has not lost tone or strength in the hand, knead the muscles and tendons in the palm, particularly the thenar muscles. Be careful not to reproduce symptoms when working in the palm. If the tissues of the hand are compromised, you may need to postpone treatment here until innernation and tone are restored. Gentle tapotement may help to build tone in these muscles. If performing tapotement, avoid the carpal tunnel if this action reproduces symptoms.

- Apply a full passive stretch to the wrist flexors. Extend the elbow and wrist fully and include the fingers and thumb in the stretch to ensure that the whole muscles are lengthened. Perform postisometric relaxation if necessary to encourage greater lengthening of the shortened wrist flexors.

Figure 7-9 Retinaculum stretch.


- Assess the wrist extensors for adhesions and trigger points and treat as necessary.

- Clear the whole arm with gentle strokes to move fluid toward proximal lymph nodes and encourage venous return. If inflammation occurred in the area during treatment, bolster the arm and cover the forearm and hand with a cool, wet towel.
- If time remains, consider treating the unaffected arm, neck, chest, or posterior thorax for patterns of compensation that may contribute to pain in these locations. If you do not have time for this in the first session, you may in subsequent sessions when the primary contributing factors require less treatment.



CLIENT SELF-CARE

The following are intended as general recommendations for stretching and strengthening muscles involved in the client's condition. The objective is to create distance between the attachment sites of muscles that have shortened and to perform repetitions of movements that decrease the distance between the attachments of muscles that have weakened. If you have had no training in remedial exercises, or do not feel that you have a functional understanding of stretching and strengthening, refer the client to a professional with training in this area.

Clients often neglect self-care because their daily lives are busy. Encourage them to follow these guidelines.

- When possible, perform self-care activities during the workday, while taking a phone call, or during other activities of daily living instead of setting aside extra time.
- Encourage the client to take regular breaks from repetitive actions.

- Demonstrate gentle self-massage to keep hypertonicity at bay between treatments.
- Instruct the client on proper posture to keep pressure off the weakened joints. Instruct clients with symptoms of carpal tunnel syndrome to sleep in positions without flexing the wrist, and to adjust their workstation to minimize flexion or extension of the wrist while typing.
- Demonstrate all strengthening exercises and stretches to your client and have them perform these for you before leaving to ensure that they are performing them properly and will not harm themselves when practicing on their own.

Stretching

Instruct the client to stretch their wrist flexors (Fig. 10). Be sure that the elbow is extended, and include the fingers and thumb when performing the stretch. Each stretch should be held at least 15–30 seconds. Extend the wrist only to the point of a comfortable stretch. The stretch should be pain-free with the affected arm fully relaxed. The client should perform stretches frequently throughout the day within their tolerance.

If pronator teres is involved, instruct the client to fully supinate the forearm with the elbow extended to stretch pronator teres. For stretches to other areas along the median nerve, see the chapter on the thoracic outlet syndrome.

Strengthening

Because wrist flexion is opposed by the wrist extensors, it is important to assess the extensors for length and strength. If the wrist extensors are weak and unable to fully oppose flexion of the wrist, the flexors are likely to return to the shortened, hypertonic state following treatment. Encourage the client to strengthen the wrist extensors within their tolerance by extending the affected wrist while gently resisting the movement with the opposite hand or a stable surface (Fig. 11).

Immobility is often the muscle's enemy. Although splinting is often recommended when a client develops symptoms of carpal tunnel syndrome, if the cause is muscular, immobility may promote the development of adhesions and thickening of the fascia. In addition, splinting the wrist may increase compensatory actions at the elbow and shoulder, putting these areas at greater risk for injury. With consent from their health care provider, encourage the client to remove the splint occasionally and gently move the wrist through its full range

Figure 7-10 Wrist flexor stretch.

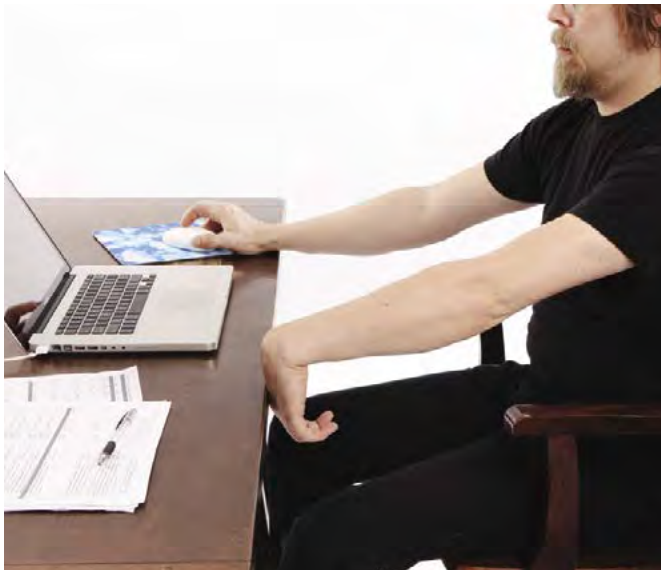


Figure 7-11 Wrist extensor strengthening.

of motion. The client should not force this movement because forceful movement of the wrist may increase symptoms. Gently drawing the alphabet in the air with the wrist and hand is a helpful exercise, but the client should stop when they feel fatigue, pain, or reproduced symptoms.

SUGGESTIONS FOR FURTHER TREATMENT

Ideally, clients with carpal tunnel syndrome will have treatments twice per week for the first week or two, or until symptoms are absent for at least 4 days. This can be followed by weekly treatments until the symptoms are absent for at least 7 days and range of motion and strength have improved. As treatment continues, the period of symptom-free days should increase until the symptoms become occasional or are relieved completely. After this, the client can schedule appointments as necessary. If the cause of symptoms is neuromuscular, some improvement should occur with each session. If the client is not improving, consider the following possibilities:

- There is too much time between treatments. It is always best to give the newly treated tissues 24–48 hours to adapt, but if too much time passes between treatments in the beginning, the client's activities of daily living may reverse any progress.
- The client does not have carpal tunnel syndrome and you may be focusing treatment on the wrong area. Remember that the symptoms may arise from several different points along the neck, shoulder, and arm.
- The client is not adjusting their activities of daily living or is not keeping up with self-care. As much as we want to fix the problem, we cannot force a client to make the adjustments we suggest.
- The syndrome is advanced or involves other complications beyond your basic training. Refer this client to a massage therapist with advanced clinical massage training. Continuing to treat a client whose case is beyond your training could turn the client away from massage therapy entirely and hinder their healing.
- There is an undiagnosed, underlying condition. Discontinue treatment until the client sees a health care provider for a medical assessment.

If you are not treating the client in a clinical setting or private practice, you may not be the therapist who takes this client through their full program of healing. Still, if you can bring some relief, the client may be encouraged to discuss this change with their health care provider and to seek manual therapy rather than more aggressive treatment options. If the client returns for regular treatments, the symptoms are likely to change each time, so it is important to perform an assessment before each session.

Professional Growth

Case Study

Caroline is a 34-year-old single mother of one 3-year-old child. She is an assistant to the president of a busy real estate firm, working at a computer an average of 40 hours per week. Caroline is very careful to prepare healthy, home-cooked meals for her family every day. She exercises three or four times per week including 30 minutes of aerobic exercise and 20 minutes of strength training with light weights. She began feeling tingling in her thumb and index finger about 3 weeks ago.

SUBJECTIVE

Client complained of pain across her shoulder and has had tingling in her thumb and index finger for 3 weeks. She reports that the symptoms are most aggravating at work in the late afternoon and when she cooks. Recently she has been awakened from sleep by the sensation. She also noted that her coffee cup feels heavier in her hand than she had ever noticed before. In her most recent visit to her physician, no systemic conditions were diagnosed, though she was diagnosed with carpal tunnel syndrome and prescribed muscle relaxants and a brace for the wrist. Her physician suggested that if the symptoms do not dissipate, surgery is an option. Caroline requested deep tissue massage to relieve tension in her neck and asked whether massage could help relieve the tingling in her fingers.

OBJECTIVE

Client wears a brace on her right wrist. She lifted the pen with her left hand and positioned it in her right before filling out her intake form. Shoulders are medially rotated, more notably on the right side. Resisted internal rotation of the shoulder produced no symptoms. There is slight left rotation and right lateral flexion of the neck. Resisted left rotation of neck produced symptoms after 27 seconds. Head is slightly forward. Pronator teres strength test was normal and reproduced no symptoms. Phalen's test is positive for carpal tunnel syndrome. Resisted extension of the right wrist showed weakness. Following the strength test, the client was resistant to other ROM testing of the wrist.

Bilateral pectoralis major and minor are hypertonic and tender to touch. Scalenes are hypertonic, especially right. Trigger point in right anterior scalene referred across shoulder. There is minimal swelling at the hand and wrist. Objective observation suggests "double crush" at scalenes and carpal tunnel.

ACTION

Right arm bolstered to increase venous return. Warm hydrotherapy applied to neck and shoulders. General warming of tissues from the neck to fingers bilaterally, followed by clearing strokes toward the axillary lymph nodes. Myofascial release across glenohumeral joints bilaterally. Petrissage to bilateral pectorals, followed by muscle stripping. No trigger points found. Full, passive bilateral pectoral stretch followed by clearing strokes toward axillary lymph nodes.

Superficial effleurage to neck bilaterally, especially sternocleidomastoid, followed by deeper effleurage to soften hypertonic neck extensors and scalenes. Slow muscle stripping followed by compression to trigger point 3/4 inch superior to the costal attachment of right anterior scalene. Client reported reduction in pain from level 8 to 6. Full stretch to neck extensors and lateral flexors. Postisometric relaxation to right scalenes. No symptoms reproduced.

Deep effleurage and petrissage followed by clearing strokes to right arm. Nothing remarkable. Myofascial release to right forearm, especially at the medial epicondyle, around the wrist and in the palm. Applied muscle stripping to right forearm flexors. Trigger point found in flexor digitorum profundus. Two rounds of compression for 20 seconds alternating with muscle stripping reduced pain from level 8 to 5.

Cross-fiber strokes to flexor retinaculum. Kneading to retinaculum attachments followed by gentle stripping plus pin and stretch along the length of retinaculum. Deep petrissage to lumbricals and interossei muscles of the hand followed by a full, passive stretch of the wrist, including fingers and thumb. Postisometric relaxation to right wrist flexors. ROM in wrist extension increased slightly. Full, passive stretch with traction to right arm. No symptoms reproduced. Clearing strokes toward axillary lymph nodes.

Remainder of time focused on unaffected arm and posterior torso, ending with relaxing massage to the head and face.

PLAN

Demonstrated forearm flexor stretches to client, with care to include the fingers and thumb. Recommended that client discuss with physician the possibility of wearing brace only when performing tasks that aggravate symptoms and at night to avoid prolonged flexion. Also suggested spending a minimum of 1 minute per hour moving the brace-free wrist in its full ROM by gently drawing the alphabet in the air within her tolerance. Scheduled 1-hour appointment 3 days from today, to be followed by reassessment. Depending on improvement, reschedule two times per week until client experiences four consecutive days without symptoms, and once per week following until client experiences longer periods symptom-free. Extensor strengthening exercises may be suggested following next appointment depending on improvement. Recommended drinking water following treatments to flush metabolites and keep the muscles hydrated.

CRITICAL THINKING EXERCISES

1. Activities of daily living, work-related postures, and repetitive motions may increase the risk of carpal tunnel syndrome. Choose a few such postures or activities and consider how they might also contribute to double crush or compression elsewhere that produces similar symptoms. For example, aside from the action at the wrist, what other postures or activities might contribute to numbness and tingling in the hand of a hair stylist?
2. Given evidence that noninvasive manual therapy is indicated for the treatment of carpal tunnel syndrome, discuss its benefits compared with more commonly prescribed treatments including surgery, medication, and immobilization. Are there side effects to medical treatments that can be avoided by treating with massage? What are some limitations of massage therapy in the treatment of carpal tunnel syndrome?
3. Discuss the possible course of treatment of a client who was diagnosed with carpal tunnel syndrome, had surgery to relieve compression of the median nerve, but has had a recurrence of symptoms. What may be some of the reasons that symptoms persist? How will you treat this client?
4. A client calls you the day after treatment and reports that her symptoms have increased. What are some possible reasons for the increase in symptoms? How might you proceed differently in the next treatment?
5. Conduct a short literature review to explain why the following conditions may put a client at greater risk for carpal tunnel syndrome:
    - Poor nutrition
    - Vitamin B deficiency
    - Obesity
    - Hypothyroid
    - Diabetes
    - Gout
    - Hormonal changes
    - Alcoholism

BIBLIOGRAPHY AND SUGGESTED READINGS

Biel A. *Trail Guide to the Body: How to Locate Muscles, Bones and More*, 3rd ed. Boulder, CO: Books of Discovery, 2005.

Bocchese ND, Becker J, Ehlers J, et al. What symptoms are truly caused by median nerve compression in carpal tunnel syndrome? Clinical Neurophysiology. 2005;116:275–283.

Burke J, Buchberger DJ, Carey-Loghmani T, et al. A pilot study comparing two manual therapy interventions for carpal tunnel syndrome. Journal of Manipulative and Physiological Therapeutics. 2007;30:50–61.

Centers for Disease Control and Prevention. Lyme Disease Diagnosis. Available at http://www.cdc.gov/ncidod/dvbid/lyme/ld_humandisease_diagnosis.htm. Accessed Spring 2008.

Clay JH, Pounds DM. *Basic Clinical Massage Therapy: Integrating Anatomy and Treatment*. Baltimore: Lippincott Williams & Wilkins, 2003.

Ettema AM, An K-N, Zhao C, et al. Flexor tendon and synovial gliding during simultaneous and single digit flexion in idiopathic carpal tunnel syndrome. Journal of Biomechanics. 2008;41:292–298.

Field T, Diego M, Cullen C, et al. Carpal tunnel syndrome symptoms are lessened following massage therapy. Journal of Bodywork and Movement Therapies. 2004;8:9–14.

Mayo Foundation for Medical Education and Research. Lupus. Available at http://www.mayoclinic.com/health/lupus/DS00115/DSECTION□6. Accessed Spring 2008.

Meek MF, Dellon AL. Modification of Phalen's wrist-flexion test. Journal of Neuroscience Methods. 2008;170:156–157.

Mell AG, Childress BL, Hughes RE. The effect of wearing a wrist splint on shoulder kinematics during object manipulation. Archives of Physical Medicine and Rehabilitation. 2005;86:1661–1664.

Moraska A, Chandler C, Edmiston-Schaetzel A, et al. Comparison of a targeted and general massage protocol on strength, function, and symptoms associated with carpal tunnel syndrome: A randomized pilot study. Journal of Alternative and Complementary Medicine. 2008;14:259–267.

Muscolino JE. *The Muscular System Manual: The Skeletal Muscles of the Human Body*, 2nd ed. St. Louis, MO: Elsevier Inc., 2005.

National Institute of Neurological Disorders and Stroke (NINDS). Carpal Tunnel Syndrome Fact Sheet. Available at http://www.ninds.nih.gov/disorders/carpal_tunnel/detail_carpal_tunnel.htm. Accessed Fall 2006.

Nidus Information Services, Inc. Carpal Tunnel Syndrome FAQ. Available at http://www.tifaq.com/articles/carpal_tunnel_syndrome-sep98-well-connected.html. Accessed Fall 2006.

Osar E. *Form & Function: The Anatomy of Motion*. Chicago: Evan Osar, 2001.

Rattray F, Ludwig L. *Clinical Massage Therapy: Understanding, Assessing and Treating over 70 Conditions*. Toronto: Talus Incorporated, 2000.

Staehler R, Cervical Herniated Disc Symptoms and Treatment Options. Available at http://www.spine-health.com/Conditions/Herniated-Disc/Cervical-Herniated-Disc/Cervical-Herniated-Disc-Symptoms-And-Treatment-Options.html. Accessed Spring 2008.

Travell JG, Simons DG, Simons LS. *Myofascial Pain and Dysfunction: The Trigger Point Manual*, 2nd ed. Baltimore: Lippincott Williams & Wilkins, 1999.

Turchaninov R. *Medical Massage*, 2nd ed. Phoenix: Aesculapius Books, 2006.

U.S. National Library of Medicine and the National Institutes of Health. Gout. Available at http://www.nlm.nih.gov/medlineplus/ency/article/000424.htm#Symptoms. Accessed Winter 2009.

U.S. National Library of Medicine and the National Institutes of Health. Herniated Nucleus Pulposus (Slipped Disk). Available at http://www.nlm.nih.gov/medlineplus/ency/article/000442.htm. Accessed Spring 2008.

U.S. National Library of Medicine and the National Institutes of Health. Hypothyroidism. Available at http://www.nlm.nih.gov/medlineplus/ency/article/000353.htm. Accessed Spring 2008.

Werner R. *A Massage Therapist's Guide to Pathology*, 4th ed. Baltimore: Lippincott Williams & Wilkins, 2005.