Ligament Sprains
Home Study Course

1 CE Hour
Text, Examination, and Course Guide

Presented by the:
Center for Massage Therapy Continuing Education
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866-784-5940 • www.massagetherapyceu.com

Instructions for the Ligament Sprains home study course

Thank you for investing in the Ligament Sprains home study course, a 1 CE hour course designed to further your knowledge in the principles and practice of treating clients with signs and symptoms of ligament sprains. This guide will contain all of the instructions you will need to complete this course. This is a 1 CE hour course, so that means it should take you approximately 1 hour to read the text and complete the multiple choice exam and course evaluation.

The following are steps to follow in completing this course:

1. **Read and review the exam and text in this file. The exam is provided for review before testing online and is the same as the online exam.**

2. **When you are ready to test online, access the online examination by logging in to your account at** https://www.massagetherapyceu.com/login.php.

3. **Complete your examination and print your certificate. The exam is open book and there is no time limit for completion.**

You must pass the exam with a 70% or better to pass this home study course. You are allowed to access and take the exam up to 3 times if needed. There is no time limit when taking the exam. Feel free to review the text while taking the test. This course uses the text *Ligament Sprains, an excerpt from Condition-Specific Massage,* by Celia Bucci. All of the answers can be found in the text. It is advised to answer the exam questions in the study guide before testing online. That way, when you are testing you do not have go back and forth through the online exam.

If you have any questions please feel free to contact us at 866-784-5940, 712-490-8245, or info@massagetherapyceu.com. Most state boards require that you keep your "proof of completion" certificates for at least four years in case of audit. Thank you for taking our Ligament Sprains home study course.

It is the responsibility of the practitioner to determine the appropriateness of the techniques presented in terms within the scope of practice. This information is in no way meant to diagnose or treat medical conditions. Written medical opinions are always the best way to resolve any questions regarding contra-indications to or advanced treatment of ligament sprains.

Ligament Sprains Exam

1. What is a sprain?
    A. An overstretch injury to a ligament
    B. An overstretch injury to a muscle
    C. An overstretch injury to a bone
    D. An overstretch injury to an organ

2. What is the most common cause of a sprain?
    A. A slow, gradual overstretching of a ligament beyond its capacity
    B. An overstretching of a ligament beyond its capacity over time caused by repetitive motions
    C. A swift, high-impact movement that stretches the ligament beyond its capacity
    D. Beginning a new activity following a period of inactivity without gradual reconditioning

3. What is hemarthrosis?
    A. Damage to capillaries allowing blood to accumulate in surrounding tissue
    B. Bleeding in the joint capsule
    C. A collection of blood outside of the blood vessels
    D. Gel-like clumps of blood which plug the blood vessel

4. All of the following are the basic goals of treating sprains EXCEPT:
    A. Reducing adhesions and scar tissue
    B. Reorienting ligament fibers
    C. Lengthening shortened muscles
    D. Weakening strong muscles

5. When is it appropriate to use resisted ROM in cases of sprains?
    A. The acute or early subacute stages of a grade 2 sprain
    B. A grade 1 sprain and/or in the late subacute or chronic stages of grade 2 or 3 sprains
    C. The acute or early subacute stages of a grade 3 sprain
    D. All of the above

6. In the chronic stage, swelling may feel:
    A. Boggy or gelatinous
    B. Dense or hard
    C. Hot to the touch
    D. Fibrous or like scar tissue

7. In general, it is best to wait at least _____ after a grade 1 or 2 sprain before beginning treatment to allow the natural healing process to set in.
    A. 24-48 hours
    B. 48-72 hours
    C. 72-96 hours
    D. 96-120 hours

8. What can you do if the area becomes hot or begins to swell while applying friction?
    A. Apply heat for just a few minutes
    B. Continue to work and do nothing
    C. Apply deeper friction to clear the area
    D. Apply ice for just a few minutes

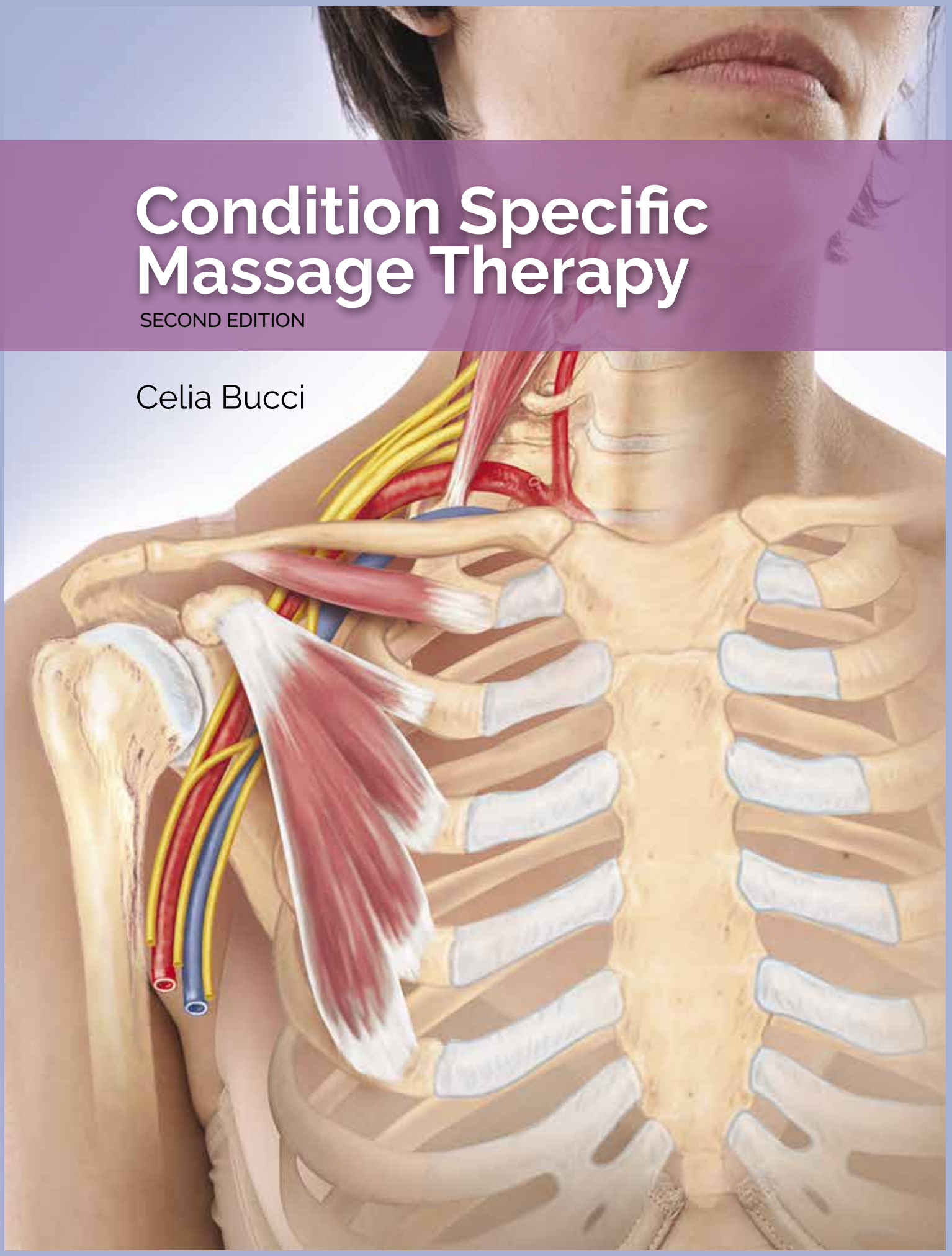
9. Which of the following is effective for gradually restoring strength to weakened muscles?
    A. Pain-free, passive ROM
    B. Pain-free, resisted ROM
    C. Pain-free, active ROM
    D. Pain-free, weight-bearing activities

This completes the Ligament Sprains exam. Proceed to the next page to view the text.

Condition Specific Massage Therapy

SECOND EDITION

Celia Bucci



Chapter 13:

Ligament Sprains

Ligament Sprains

Understanding Ligament Sprains

A sprain is an overstretch injury to a ligament. Ligaments are tough but flexible fibrous bands composed mainly of collagen. They function to stabilize joints, restrict excessive movement, and prevent the movement of a joint in a direction that may cause injury. Some ligaments, such as the flexor retinaculum of the wrist, also form structures like the carpal tunnel that contain tendons, nerves, and vessels that cross a joint. Ligaments vary in shape, allowing specific bundles of fibers to be recruited for a specific movement within the full ROM of the joint. They are functional only under tensile stress. During a contraction that moves a joint, the ligament that lengthens functions to keep the joint from moving out of its normal range. A ligament that is compressed during the movement of a joint has no real function.

In order to manage the complex, multidirectional forces associated with joint movement, ligaments are formed from dense regular connective tissue with fibers arranged in a slightly less parallel manner than tendon fibers. Like tendons, the collagen fibers in ligaments are crimped to allow lengthening without causing damage. When the tensile load increases, the collagen fibers begin to uncrimp, and the ligament lengthens. As tension increases due to additional load or when the load continues for an extended period, more fibers uncrimp, the ligament stiffens to resist the stretch, and energy is absorbed. This is referred to as creep. When this lengthening occurs slowly and the load does not exceed the ligament's ability, the ligament adapts to manage the load. On the other hand, swift and high-impact movements, as well as constant or repetitive tensile stress, reduces the ligament's ability to adapt to the load. If the tensile load exceeds the ligament's ability to resist, it can stretch to the point of failure—termed a sprain. In many cases, ligaments that are severely or repeatedly sprained never recover their full structural or functional strength; however, the joints they cross can recover full function if other structures affecting the joint are healthy.

If the tensile load that lengthens a ligament is constant or repetitive, the ligament may deform into a shape that is less effective for preventing movements that may cause injury. Likewise, if the position of a joint is repeatedly altered due to poor body mechanics or is constantly altered when tight muscles prevent the joint from maintaining an ideal posture, the ligament may deform to adapt to the postural deviation. As collagen regenerates, tension can be restored in the ligament if it is given enough time to recover. The greater the deformation, the longer it takes to recover. Constant or repetitive distortion can lead to ligament laxity, which puts the ligament at greater risk for sprain and increases the risk of injury to other structures crossing the joint.

Injury to a ligament often initiates an inflammatory response. Acute inflammation accompanies the healing process, and with rest, aids in restoring strength and proper functioning. Without sufficient rest and healing, however, inflammation can become chronic. Chronic inflammation can lead to atrophy, potentially weakening the ligament permanently. Scar tissue also forms during the healing process of a ligament injury. However, scar tissue has inferior biomechanical function and stability compared to healthy ligaments. It deforms more easily under tensile stress and can bear only a fraction of the load that a healthy ligament can.

When a ligament is injured, neurological signals activate reflexive muscle activity to stabilize the joint. A reflexive contraction may develop on one side of the joint to compensate for the lost stability resulting from the ligament injury while reflexive inhibition may develop to keep opposing muscles from contracting intensely enough to pull the weakened joint out of place and further damage the ligament. For example, the radial collateral ligament of the wrist limits ulnar deviation. If it is sprained, the muscles that produce radial deviation (extensor carpi radialis longus and brevis and flexor carpi radialis) may contract while the muscles that

produce ulnar deviation (extensor carpi ulnaris and flexor carpi ulnaris) may be inhibited to limit movements previously controlled by the now-injured ligament. In addition, muscles that do not cross the affected joint may also be activated or inhibited to improve stability indirectly.

Damage to a ligament also affects its mechanoreceptors and nerve endings, affecting proprioception, altering the client's perception of the normal position and function of the joint. During the healing process, this compensation is essential to minimize the risk of re-injury. Once scar tissue has formed, collagen is regenerated, and the relative strength of the ligament is restored, rehabilitation must include restoring the normal resting tone of the muscles crossing the joint as well as normalizing proprioception.

COMMON SIGNS AND SYMPTOMS

Sprains can occur in any joint but occur most often in the ankles, knees, wrists, and fingers (Fig. 1). Overstretching may result in injury ranging from minor tears to a complete rupture of the ligament. Signs and symptoms differ depending on the grade (severity of the injury) and stage (duration of symptoms) of the sprain. In general, sprains produce local pain, stiffness, pain on passive stretch, and impaired ROM. Bruises and inflammation may be present in the acute and early subacute stages.

Figure 13-1A Ligaments of the ankle
Image Credit: Nucleus Medical Media.//nmal.nucleusmedicalmedia.com/anatomy-of-the-foot-and-ankle/view-item?ItemID=65725.

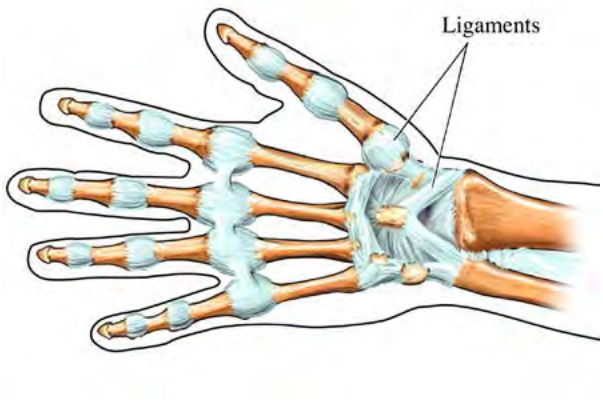


Figure 13-1B Ligaments of the wrist and fingers
Image Credit: Nucleus Medical Media. //nmal.nucleusmedicalmedia.com/ligaments-of-the-hand/view-item?ItemID=4313.

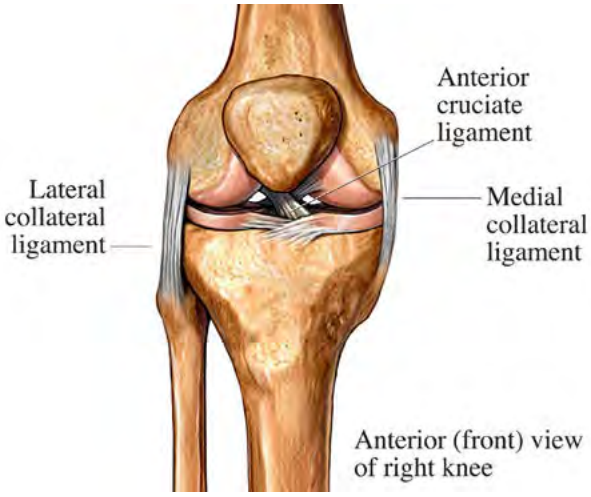


Figure 13-1C Ligaments of the knee
Image Credit: Nucleus Medical Media. //nmal.nucleusmedicalmedia.com/anterior-knee-ligaments/view-item?ItemID=7332.

Table 13-1: Grades and Stages of Ligament Sprains

	GRADE 1	GRADE 2	GRADE 3
	Mild strain Minor stretch or tear	Moderate sprain Tearing of several to most fibers	Severe sprain Complete rupture of ligament or separation of ligament from bone
Acute stage (symptoms typically last 2–3 days following injury)	Joint remains stable Mild, localized discomfort with activity and at rest Minimal or no local edema Minimal or no bruising	Joint becomes slightly unstable Snapping sound or feeling when injured Moderate local edema Moderate bruising Moderate local tenderness Moderate pain with activity and at rest Moderate decrease in ROM Possible strain to muscles crossing the injured joint Possible protective muscle spasm crossing affected joint(s)	Joint is unstable Snapping sound or feeling when injured Severe pain at time of injury Difficulty or inability to continue activity ROM is impaired Considerable local edema Considerable red or purple bruising Possible hematoma, particularly if joint capsule is injured Possible strain to muscles crossing the injured joint Possible protective spasm in muscles crossing affected joint(s)
Subacute stage (symptoms typically remain from 2-4 weeks following the acute stage)	Joint is stable Minimal to no pain Scar developing at site of injury if tearing occurred Adhesions developing at and around site of injury Reduced ROM Possible trigger points in muscles crossing the affected joint	Joint is stable but may be hypermobile in the direction normally restricted by the injured ligament Pain improved since acute stage Bruising may be changing color to yellow or green Scar developing at site of injury Reduced ROM Adhesions developing at and around the site of injury Protective muscle spasm may diminish and may be replaced by hypertonicity Possible trigger points in muscles crossing affected joint Impaired proprioception at the joint	Joint remains unstable and hypermobile in the direction normally restricted by the injured ligament Pain may have improved since the acute stage Bruising remains and may be changing color to yellow or green Adhesions developing at and around the site of injury Significant scarring if ligament was surgically repaired Reduced ROM Protective muscle spasm may continue or may diminish and may be replaced by hypertonicity Possible trigger points in muscles crossing the affected joint Impaired proprioception at the joint
Chronic stage (symptoms continue beyond the subacute stage)	Joint is stable Trigger points, scars, adhesions, and hypertonicity may still be present in compensating structures and surrounding tissues Discomfort when affected ligament is stretched Increased risk of re-injury if not properly treated Chronic edema if not properly treated Loss of proprioception at joint if not properly treated	Joint is stable Bruising has cleared Trigger points, scars, adhesions, and hypertonicity affect compensating structures and surrounding tissues Discomfort or pain when affected ligament is stretched Reduced ROM in affected joint Increased risk of re-injury, chronic edema, loss of proprioception, or possible atrophy if not properly treated	Joint may remain unstable if the ligament was not surgically repaired Bruising has cleared Atrophy may result if a joint has been immobilized Trigger points, scars, adhesions, and hypertonicity affect compensating structures and surrounding tissues Reduced ROM in affected joint Increased risk of overuse injury to compensating structures if affected ligament was not surgically repaired Chronic edema if not properly treated Loss of proprioception at joint if not properly treated

POSSIBLE CAUSES AND CONTRIBUTING FACTORS

The most common cause of sprain is a swift, high-impact movement that stretches the ligament beyond its capacity. This often occurs in sports and other high-impact activities but may also occur when factors including systemic disorders, deconditioning, or repetitive actions weaken the ligament and destabilize the joint; in this situation, the ligament may sprain during common activities of daily living. Beginning a new activity following a period of inactivity without gradual reconditioning increases the risk of sprain. Similarly, sufficient warm-up prior to vigorous activity increases ROM and may help prevent sprain. Poor technique during new, intense, or repetitive activities increases the risk of sprain. Structures that are fatigued due to prolonged activity, improper warm-up, or poor technique may not be able to support the joint properly, thus, increasing the risk of sprain.

Once a sprain occurs, failing to allow sufficient time for healing in the early stages can slow or halt the natural healing process. When overstretching or small tears in the ligament results in scar tissue that is not strong enough to resist further tearing, the inflammatory process will continue, compromising the structure's integrity, and the risk of repeated injury increases. Similarly, continuing activity that encourages the inflammatory process may weaken the structure and cause compensating patterns to become habitual. Continuing aggravating activities once degeneration has begun may inhibit regeneration of collagen and continue to weaken the ligament.

However, immobility can also cause the ligament to degenerate and weaken, increasing the risk of injury with activity. Reduced loading can lead to rapid tissue degeneration. Sensible activity followed by rest strengthens the ligament, aids in collagen regeneration, and over time increases stability during more taxing activities. For this reason, it is important to ease into new activities after periods of inactivity to prevent injury and to ease into moderate activity as soon as possible following an injury to aid healing. While some rest or at least limiting of the aggravating activity is necessary to allow healing to begin, movement also keeps adhesions at bay and reduces ischemia.

Insufficient rehabilitation following a sprain, as well as repeated sprain to the same ligament, reduces tension in the ligament and often leaves a joint unstable. Joint instability significantly increases the risk of injury. As the body ages, regeneration of collagen and elastin fibers slows. Once this occurs, ligaments are at greater risk for sprain, and it becomes increasingly less likely that full function of an injured ligament will be restored. Maintaining strong, healthy muscles increases joint stability and may reduce the risk of injury.

Being overweight as a result of pregnancy or weight gain increases demand on the musculoskeletal system during all activities and may increase the risk of spraining a ligament, particularly in weight-bearing joints. During pregnancy, women also produce higher levels of the hormone relaxin, which softens collagen and loosens the ligaments to allow the uterus and surrounding structures to adapt to the growing fetus and prepare for childbirth. This can cause systemic ligament laxity, increasing the risk for sprain. Similarly, fluctuations of estrogen and progesterone during the menstrual cycle may also affect the integrity of ligaments. Ligament laxity can also be a genetic condition, often associated with Marfan Syndrome, Stickler's Syndrome, and Ehlers-Danlos Syndrome. With these conditions, other organs and connective tissues may be affected. Consult your pathology book for contraindications and special considerations for clients with these conditions. Rheumatoid arthritis and osteoarthritis may also predispose a client to ligament injuries.

Sprains have fairly distinct signs and symptoms but can be confused with other conditions or may contribute to pain associated with another condition. For example, pain and swelling with minimally reduced ROM may result from a grade 1 sprain but can also be a symptom of tendinosis. Sprains can be confused with or can contribute to many of the conditions common to specific joints, such as carpal tunnel syndrome and patellofemoral syndrome. Neck pain, back pain, and low back pain can involve sprains to the ligaments that stabilize the vertebrae, which should be considered in treatment. A swift, high-impact movement that causes a sprain may also fracture a bone. If you suspect a fractured bone, refer the client for medical assessment before initiating treatment.

It is important to understand the client's health history, precipitating events, and other possible causes of pain in the area before proceeding with treatment. Table 2 lists some general conditions commonly confused with or contributing to sprains. Consult your pathology book for more detailed information. If you are unsure and the client's symptoms resemble those of a more serious condition, particularly if the client has other risk factors, refer them to a health care provider for medical assessment.

Table 13-2: **Differentiating Conditions Commonly Confused with or Contributing to Ligament Sprains**

CONDITION	TYPICAL SIGNS & SYMPTOMS	TESTING	MASSAGE THERAPY
Muscle strain	Swelling, bruising, and local pain Reduced ROM Pain on active contraction or stretching of the affected muscle Weakness	Often self-assessed Physical exam	Massage is indicated.
Tendinopathy	Often has gradual onset Pain, tenderness, and swelling at affected tendon	Physical exam Localized pain on full passive stretch X-ray may be performed to rule out other conditions	Massage is indicated.
Avulsion fracture	Bone fragments at the attachment site of a tendon or ligament often accompany strains and sprains Moderate local pain Bruising and inflammation	X-ray	Local massage is contraindicated in the acute stage. Caution is used when treating surrounding tissues to avoid further injury. Massage may help to prevent further injury when muscle tension is a contributing factor.
Bursitis	Pain, particularly with activity or palpation Heat, redness, swelling, or tenderness local to the affected bursa	Physical exam ROM tests X-ray or MRI if conservative treatment is not successful	Massage is systemically contraindicated if bursitis is due to infection. Massage is locally contraindicated in the acute stage to avoid increased swelling. In the subacute stage, massage to the structures surrounding the joint is indicated.

CONTRAINDICATIONS AND SPECIAL CONSIDERATIONS

First, it is essential to understand the cause of pain. If the client is unable to move the joint, heard a popping sound, or has significant weakness, or if you suspect the client has a fractured bone or experienced significant tearing to the tissues, work with the client's health care provider, and consult a pathology text for massage therapists before proceeding. These are a few general cautions:

- **Hemarthrosis.** Significant swelling that occurs within the first 20 minutes of injury to a joint may indicate hemarthrosis—bleeding in the joint capsule (Fig. 2). Other signs may include burning or tingling in the joint and a feeling of fullness that may prevent movement of the joint. The client should be referred to a medical professional for assessment and possible aspiration of the joint.

- **Bruises.** A bruise indicates damage to capillaries allowing blood to accumulate in surrounding tissue. Avoid direct pressure on a bruise that is still healing. As the capillaries heal and blood is resorbed, the color changes from red or purple to green or yellow. In some cases, severe bruising may result in a hematoma—a localized pooling of blood outside the vessels. In some cases, a sac-like enclosure forms around the pool of blood to minimize internal bleeding. A hematoma often resolves on its own, similarly to a simple bruise, but if it grows or hardens, it may require medical attention. Avoid direct pressure to a hematoma, and refer the client to a health care professional if the area becomes hard, if the client reports feeling pressure from the hematoma, or if it does not show signs of resolving over the course of a week or two.
- **Muscle testing.** Use only active ROM testing in the acute stage of a grade 2 or 3 sprain. The client usually limits active movements to the pain-free range. P ROM and R ROM testing may cause further injury.

Figure 13-2 Acute hemarthrosis.

- **Protective muscle splinting.** When a ligament is injured, the muscles that cross the affected joint may spasm reflexively in an attempt to limit the joint's movement to prevent further injury. Do not reduce protective muscle splinting in the acute stage of injury. Wait until the late subacute or chronic stage, when sufficient scarring and fiber regeneration reduce the need for protective splinting.
- **Re-injury.** Avoid ROM and traction techniques that stretch the injured ligament until the integrity of the structure is restored.
- **Treatment duration and pressure.** If the client is elderly, has degenerative 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.
- **Friction.** Do not use deep frictions if the health of the underlying tissues is at risk for rupture. Allow time for scarring and fiber regeneration to avoid re-injury. Do not use friction if the client is taking anti-inflammatory medication or anticoagulants. Friction creates an inflammatory process, which may interfere with the intended action of anti-inflammatory medication. Recommend that the client refrain from taking such medication for several hours prior to treatment if the health care provider is in agreement. Because anticoagulants reduce clotting, it is best to avoid techniques that may cause tearing and bleeding.

MASSAGE THERAPY RESEARCH

Several reports on the use of massage in the treatment of sprains were written in the late nineteenth and early twentieth century. While we have learned much more about the structure and function of ligaments since then, as well as about the benefits of massage, few studies investigating the specific effects of massage therapy on the healing of sprains have been conducted more recently. Several studies do report significant improvement of sprains treated with a combination of therapies including ultrasound, acupuncture, chiropractic manipulation, and massage techniques such as transverse friction. Because it is impossible to distinguish the specific value of massage techniques when combined therapies are used, these studies are not cited here.

In "A Theoretical Model for Treatment of Soft Tissue Injuries: Treatment of an Ankle Sprain in a College

Tennis Player," Gemmell et al. (2005) present a case study exemplifying the potential benefits of manual therapy for the healing of sprains. The subject was a 21-year-old male tennis player with ankle pain for 6 weeks following an inversion sprain. Although the subject was able to walk pain-free after 6 weeks of cryotherapy, electrotherapy, and anti-inflammatory medication prescribed by the team physician, he was unable to perform activities such as running or jumping and could not return to tennis, reporting a pain level of 8 out of 10. When asked to indicate the area of pain, he pointed to the anterior aspect of the ankle and the lateral, distal lower leg. At the time of his initial visit with the study's authors, 6 weeks after the injury, the subject presented with mild swelling, no bruising or crepitus, limited dorsiflexion, and tenderness on palpation of the anterior talofibular and tibiofibular ligaments. The study's authors diagnosed a mild sprain with dysfunction of the anterior ankle ligaments and myofascial distortions in the peroneal muscles. Manual therapy consisted of firm stroking of the peroneal attachment sites and muscle stripping to the peroneal muscles to repair myofascial distortions. The subject played tennis for 2 days following treatment and returned with mild discomfort when jumping. The peroneals were treated once more, and 1 week later, the subject returned to competitive tennis. Nine months after treatment, the client reported no pain or dysfunction of the ankle.

Working with the Client

CLIENT ASSESSMENT

While swift, high-impact movements often cause obvious, and often self-diagnosed, sprains, less obvious sprains can result from poor body mechanics and repetitive actions. For example, improper lifting, twisting, and obesity can affect the spinal ligaments and those that connect the spine to the pelvis and may contribute to low back pain. Consistently standing with the weight on one leg forces changes in the alignment of the leg, pelvis, and spine, increasing the risk of spraining ligaments that cross those joints. Assessing sprains with less obvious signs may require advanced training, although some clues may be present. Pain upon palpation along the length of a ligament or its attachment sites that is greater than tenderness in muscles around it may suggest a sprain. Localized pockets of inflammation may also suggest a sprain. In addition, unexplained spasm of muscles that cross a joint may be a protective mechanism for a sprained ligament. The good news is that with these sorts of sprains, reducing muscle spasm and hypertonicity, releasing fascial restrictions and adhesions, and adjusting body mechanics can greatly encourage the ligament's natural healing process.

With readily recognizable sprains, assessment and treatment of the surrounding soft tissues is essential. When mild, grade 1 sprains contribute to the symptoms of another condition, the following treatment recommendations are meant to aid healing and reduce the risk of re-injury. Reducing adhesions and scar tissue, reorienting ligament fibers, lengthening shortened muscles, and strengthening weak muscles are the basic goals of treating sprains.

More serious grade 2 and 3 sprains require more focused attention. If you do not have the advanced training necessary to treat a complicated case or if symptoms in the subacute stage continue to significantly reduce activities of daily living, the client should be assessed by a health care provider and cleared for massage therapy prior to treatment. Swelling and bruising in the acute stage of a grade 2 sprain can be significant enough to contraindicate local treatment. Significant swelling that occurred within 20 minutes of the injury may indicate bleeding that poses a greater risk for hemarthrosis, hematoma, or injury to structures other than a ligament; this requires medical attention. An acute, grade 3 sprain requires medical attention. If surgical repair poses more risk than benefit, the ligament may be left severed, although in most cases the ligament is surgically repaired, and the client is prescribed physical therapy. Regardless of whether the ligament has been surgically repaired, you are most likely to see a client in subacute or chronic stage of a grade 3 sprain as part of a program to reduce pain, limitations in ROM, or compensating patterns that may have developed.

Because sprain can occur in any ligament, the following descriptions do not specify structures as in previous chapters. Refer to the previous chapters as needed to determine fiber direction, joints crossed, superficial versus deep structures, and so on.

Assessment begins during 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 specific area of pain so that you can prepare yourself.

Table 13-3: **Health History**

QUESTIONS FOR THE CLIENT	IMPORTANCE FOR THE TREATMENT PLAN
Where do you feel symptoms?	The location of symptoms helps to identify the precise location of stretched or torn fibers and contributing factors.
Describe what your symptoms feel like.	A description of symptoms including weakness, heat, or fullness in the area may help you to determine the stage and degree of sprain and whether there may be more significant damage.
When did the symptoms begin?	The date of injury may help you to determine the stage of the injury and the health of the tissue.
What were you doing when you first felt the pain? Did you hear a snap or feel a twinge in the area at the time of injury?	In the absence of a clear incident of swift, forceful stretching of a ligament, the details of the activity or posture that initiated the pain may help you to determine its cause.
To what degree were you able to continue activity following the injury?	The level of activity following injury may help you to determine the degree of the sprain. Inability to continue activity suggests a grade 3 sprain and should be referred for medical assessment.
Did significant swelling occur within the first 20 minutes of injury?	Rapid swelling at the time of injury may indicate hemarthrosis or hematoma. The client should be referred for medical assessment.
Do you have a history of injury or surgery to this area?	An explanation of a prior injury to the area may help you to locate the sprain and determine contributing factors. Surgery and resulting scar tissue may increase the risk of sprain.
Do any movements make your symptoms worse or better?	Locate weakness in structures producing such movements. Lengthening of the affected ligament is likely to increase symptoms. Adding slack or reducing tension in the ligament may decrease symptoms.
Have you seen a health care provider for this condition? What was the diagnosis? What tests were performed?	Medical tests may reveal the degree of sprain, fractures, or coexisting injuries. If no tests were performed to make a diagnosis, use the tests described in this chapter for your assessment. If your assessment is inconsistent with a diagnosis, ask the client to discuss your findings with a health care provider or ask for permission to contact the provider directly.
Are you taking any prescribed or over-the-counter medications or herbal or other supplements?	Medication of all types may contribute to symptoms or involve contraindications or cautions.
Have you had a corticosteroid or analgesic injection in the past 2 weeks? Where?	Local massage is contraindicated. A history of repeated corticosteroid injections may affect the integrity of soft tissues increasing the risk of tearing or rupture. Use caution when applying pressure or cross-fiber strokes. Analgesics reduce sensation and may cause the client to allow you to work too aggressively.
Have you taken a pain reliever or muscle relaxant within the past 4 hours?	The client may not be able to judge your pressure and may allow you to work too aggressively.
Have you taken anti-inflammatory medication within the past 4 hours?	Have you taken anti-inflammatory medication within the past 4 hours? Deep friction initiates an inflammatory process 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 movement. Look for imbalances in movement of the joint crossed by the affected ligament or patterns of compensation that may develop to protect the injured structures. If the lower body is affected, watch as the client walks or climbs steps. If the upper body is affected, watch as the client opens the door, takes off their coat or lifts a pen. If the thorax is affected, notice how the client moves the spine. Look for reduced mobility or a favoring of one side. Watch as the client sits, stands from sitting, lifts or sets down objects, turns to talk to you, and so on to see if they perform these activities without assistance or if they avoid bearing weight with the affected joint. The grade and stage of the sprain influence the level of imbalance and compensation.

When assessing standing posture, be sure that the client stands comfortably. If they deliberately attempt to stand in the anatomic position, you may not get an accurate assessment of their posture in daily life. When sprain affects the lower body, the client may stand in a position that keeps weight off the affected joint. When the upper body is affected, the client may hold the joint in a position that keeps the injured ligament from stretching. If the client has braced the injury with a removable device, ask them to remove it if it is possible to bear the weight without it so that you can get an accurate picture of the strength of the injured joint.

ROM Assessment

Test the ROM of the joint crossed by the sprained ligament. Only active ROM testing should be performed with a grade 2 or 3 sprain in the acute and early subacute stages to avoid further injury. In the chronic stage, the client may have developed compensating patterns, causing pain in other joints that should also be tested. Advanced training that includes more detailed instruction and precautions for ROM testing in the acute and early subacute stages is necessary.

Active ROM

Compare your assessment of the client's active ROM in the affected joints to the values listed in the Average ROM boxes in previous chapters. Pain and other symptoms may not be reproduced during active ROM assessment because the client may limit movement to a symptom-free range. Protective muscle spasm may reduce ROM in the direction that would stretch the ligament.

- **Active ROM of the affected joint** will be limited, particularly in the direction that stretches the injured ligament. Limitations are more significant with more severe grades of sprain and diminish as the stages of injury progress from acute to chronic. A grade 1 or 2 sprain in the acute stage may be limited by discomfort upon stretching of the affected ligament; grade 3 sprains produce severe pain and little to no movement of the affected joint(s), due in part to swelling and protective muscle spasm.

Passive ROM

P ROM should not be performed in the acute or early subacute stages of a grade 2 or 3 sprain to avoid further injury. In the late subacute or chronic stage, perform P ROM slowly to pinpoint which ligament is injured. Note and compare the end feel for each range. Compare the client's P ROM on one side to the other when applicable.

- **P ROM of the affected joint** in the acute stage of a grade 1 sprain may be slightly limited and may cause pain when movement lengthens the affected ligament. Results may be similar in the subacute and chronic stages for all grades of sprain with varying degrees of limitation and pain depending on the stage of healing. ROM testing following a grade 3 sprain that was not surgically repaired is intended to assess whether the muscles crossing the joint are strong enough to stabilize it and whether persistent muscle spasm restricts mobility.

Resisted ROM

R ROM should not be performed in the acute or early subacute stages of a grade 2 or 3 sprain to avoid further injury. Use resisted tests to determine if muscles crossing the affected joint were also strained and to assess the strength of the muscles that cross the affected joint for a grade 1 sprain, and in the late subacute or chronic stages of grade 2 or 3 sprains. Compare the strength of the affected side to the unaffected side when possible.

- **R ROM of the affected joint(s)** with a grade 1 sprain in all stages and with a grade 2 or 3 sprain in the subacute and chronic stages may be limited because of pain if the muscles were also injured. R ROM should be applied with a gradual increase in resistance to avoid further injury while assessing muscle strength. ROM is limited by reduced strength and pain at the site(s) of injury to the muscle. If protective muscle spasm persists into the subacute and chronic stages of sprain, ROM may be limited because of pain on contraction of the muscle(s) in spasm or of their weakened antagonists.

Special Tests

A swift, high-impact movement causing a ligament sprain may also injure the muscles crossing the affected joint. In the subacute and chronic stage of the sprain, use ROM testing to assess the strength and length of muscles that may have been strained. In addition, protective muscle spasm may occur to help stabilize the injured joint. Once protective muscle spasm is no longer necessary, treating muscles that cross the injured joint and those that compensate for joint instability is essential for recovery.

A ligamentous stress test is used in the late subacute and chronic stages of sprains to determine which ligament crossing the injured joint is sprained and the grade of the sprain. Because the ligamentous stress test involves applying overpressure at the end of the ROM that stretches the ligament, it is not used in the acute stage to avoid further injury before natural healing has begun to strengthen the affected structures.

Figure 13-3 Ligamentous stress test. Determine which ligament crossing an injured joint may be sprained.

Ligamentous stress test:

1. Passively move the joint in the direction that stretches the ligament. (Fig. 3) To determine which ligament(s) is sprained, it is necessary to know the attachment sites of each ligament crossing the joint in order to move the joint in the precise direction that stretches each ligament.
2. In the late subacute or chronic stage of sprain, carefully apply slight overpressure at the end of the ROM to minimally stress the ligament without causing further injury or undue pain.
3. A grade 1 sprain will produce local pain specific to the injured ligament with overpressure. There is a soft capsular end feel with no joint laxity. A grade 2 sprain will produce significant local pain specific to the injured ligament with overpressure. There is a loose ligamentous end feel with possible joint laxity. Because a grade 3 sprain is the complete rupture of a ligament, ROM will not stretch the injured ligament, and any pain produced with overpressure is not specific to the injured ligament. Pain produced with ROM of a known grade 3 sprain may indicate a lesser grade sprain to another ligament, a muscle strain, or a tendinopathy, or it may occur if the client contracts opposing muscles to prevent further ROM. The end feel is empty with joint laxity.

Palpation Assessment

Avoid direct pressure on a fresh bruise or an edematous area in the acute stage. In the acute stage, when the inflammatory process is active, the area may be red and hot, and the texture of the edematous area may be dense or hard as if the area is too full and stretching the skin. When the inflammatory process diminishes,

the edematous area may feel softer and less dense. In the chronic stage, the edematous area may feel boggy or gelatinous, and the area may feel cool due to ischemia. Swelling that persists and continues to feel dense or hard beyond the acute stage may indicate a hematoma. Refer the client to a health care provider for medical assessment.

The site of injury may be tender to the touch in all stages, although the amount of pressure needed to elicit a response differs according to the grade of sprain and increases as the injury progresses into later stages. Tenderness diminishes as the injury heals. Although most ligaments are very deep, you may be able to feel a gap in the affected fibers, particularly with a grade 2 or 3 sprain. The gap will fill in as scar tissue forms and collagen regenerates. If a grade 3 sprain was not surgically repaired, the gap will remain. As time passes, scar tissue that forms to stabilize the affected structures will become thicker, denser, and possibly fibrous. Adhesions may develop, reducing mobility between the ligament and surrounding tissues. If not properly treated, scarring, adhesions, and remaining edema may reduce local circulation, resulting in ischemia, which may feel cool to the touch. When assessing muscle tone, you may find protective spasms in the muscles crossing the affected joint in the acute and early subacute stages. This protective spasm occurs to keep the joint from moving to a point that may cause further injury. Do not reduce protective spasms in the early stages. As healing progresses, the spasm may cease naturally, but the muscles may remain hypertonic. Trigger points may develop in any of the compensating soft tissues. If the severity of the injury prevents movement of the joint or if the injury was not treated well enough to restore ROM, you may find atrophy in the affected muscles.

To effectively treat a sprain, you must locate the precise site of injury and know the direction of the fibers of the affected ligament. Take your time palpating the location. Once you have identified the affected ligament(s) with ROM testing, palpate them slowly, covering approximately 1 inch of tissue over 5-10 seconds. Stay focused, and allow the receptors in your fingers to transmit important information. Feel for gaps, scars, or other anomalies in texture, tone, temperature, and tenderness.

CONDITION SPECIFIC MASSAGE

The remainder of this chapter focuses on grade 1 sprains in all stages and grade 2 and 3 sprains in the late subacute and chronic stages. While massage therapy may be beneficial for grade 2 sprains in earlier stages, because of the potential for contraindications and complications, advanced training is needed. An acute grade 3 sprain requires medical attention. In the later stages of healing following a grade 3 sprain that was not surgically repaired, focus on releasing restrictive adhesions, hypertonicity, and trigger points to compensating structures, and restoring ROM and strength in the affected joint(s). If the ligament was surgically repaired and is accessible, releasing restrictive adhesions and realigning scar tissue are an integral part of restoring ROM and strength. For sprains to ligaments that are inaccessible manually, such as the cruciate ligaments of the knee, focus on the surrounding structures with the goal of restoring ROM, strength, and stability.

The treatment goals and techniques are the same for grade 1 sprains in all stages and grade 2 or 3 sprains in the late subacute and chronic stages, but the intensity of treatment should be adjusted according to the severity of injury. For example, a grade 1 chronic sprain resulting in minor scarring and dysfunction does not present as significant a risk of re-injury during a stretch as a grade 2 sprain with moderate scarring or a surgically repaired grade 3 sprain with severe scarring. A grade 3 sprain is likely to have developed much more extensive protective muscle spasms and adhesions than lower grade sprains, and it will require more warming of superficial tissues and a slower pace when approaching the deeper tissues than lower grade sprains require. You are more likely to be able to focus directly on the injured ligament in the earlier stages of a grade 1 sprain, while a grade 2 sprain requires more attention to the compensating and surrounding structures before addressing the torn fibers directly.

In general, it is best to wait at least 24–48 hours after a grade 1 or 2 sprain before beginning treatment to allow the natural healing process to set in. Following this period, the extent of treatment depends on the severity of the sprain. A grade 1 sprain can be treated with manual therapy directly following the waiting

period. For a grade 2 sprain, the focus for the initial treatment is short sessions focused on gentle mobilization, particularly if swelling persists and the tissues are tender to the touch. As the ligament heals and the client is better able to tolerate pressure, longer and more focused treatment including friction is indicated. Massage for a grade 3 sprain is best applied in the subacute stage under the supervision of a health care provider, or in the chronic stage when the joint has stabilized, and can be of a longer duration.

It is essential for treatment to be relaxing. You may not be able to eliminate the symptoms associated with a ligament sprain or any coexisting conditions in a single treatment. Do not attempt to do so by treating aggressively. Be sure to ask your client to let you know if the amount of pressure that 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. Ask the client to let you know if any part of your treatment reproduces symptoms, and always work within their tolerance.

The following are suggestions for treating pain, weakness, and limited ROM caused by the overstretching or tearing of a ligament. These suggestions are generalized for any ligament affected by sprain. Refer to prior chapters for resources pertaining to specific muscles crossing the affected joint.

Treatment Goals:


Increase circulation


Reduce adhesions


Reduce tone/ tension


Lengthen tissue


Treat trigger points


Passive stretch


Clear area

- Positioning and bolstering depends on the structures being treated. The affected joint should rest comfortably in a position that prevents overstretching of the injured ligament.

- If you find local inflammation, bolster the area when possible to allow gravity to draw fluid toward the nearest lymph nodes, and apply superficial draining strokes. If necessary, apply ice to the area for just a few minutes to reduce swelling, taking care not to chill the surrounding tissues that are hypertonic or in spasm.


- If local swelling is minor or absent and bruises have sufficiently faded, apply brief, moist heat to the affected ligament to soften scar tissue and adhesions and to increase circulation. If protective muscle spasm is no longer beneficial to prevent re-injury, apply moist heat to hypertonic, compensating muscles.


- Use your initial warming strokes to increase superficial circulation, soften tissues, and assess the tissues broadly surrounding the site of injury and compensating for the injured joint. You should be able to initially assess for adhesions, hypertonicity, protective muscle spasm, and tensile stress, which will help you to determine how to focus your time.


- Based on your findings, treat compensating muscles proximal to the site of injury for myofascial restrictions, adhesions, shortening, and hypertonicity.

- Assess for and treat trigger points that may have developed in compensating structures during the protective phase of healing and those that refer to the general area of injury.

- Assess and treat fascial restrictions surrounding the injured ligament.

- Using focused palpation, locate the precise site of the sprain and, if possible, the direction of tearing. Using short, slow strokes within the client's pain tolerance, apply cross-fiber friction to reduce adhesions and scar tissue at the site of injury. Follow this with longitudinal strokes

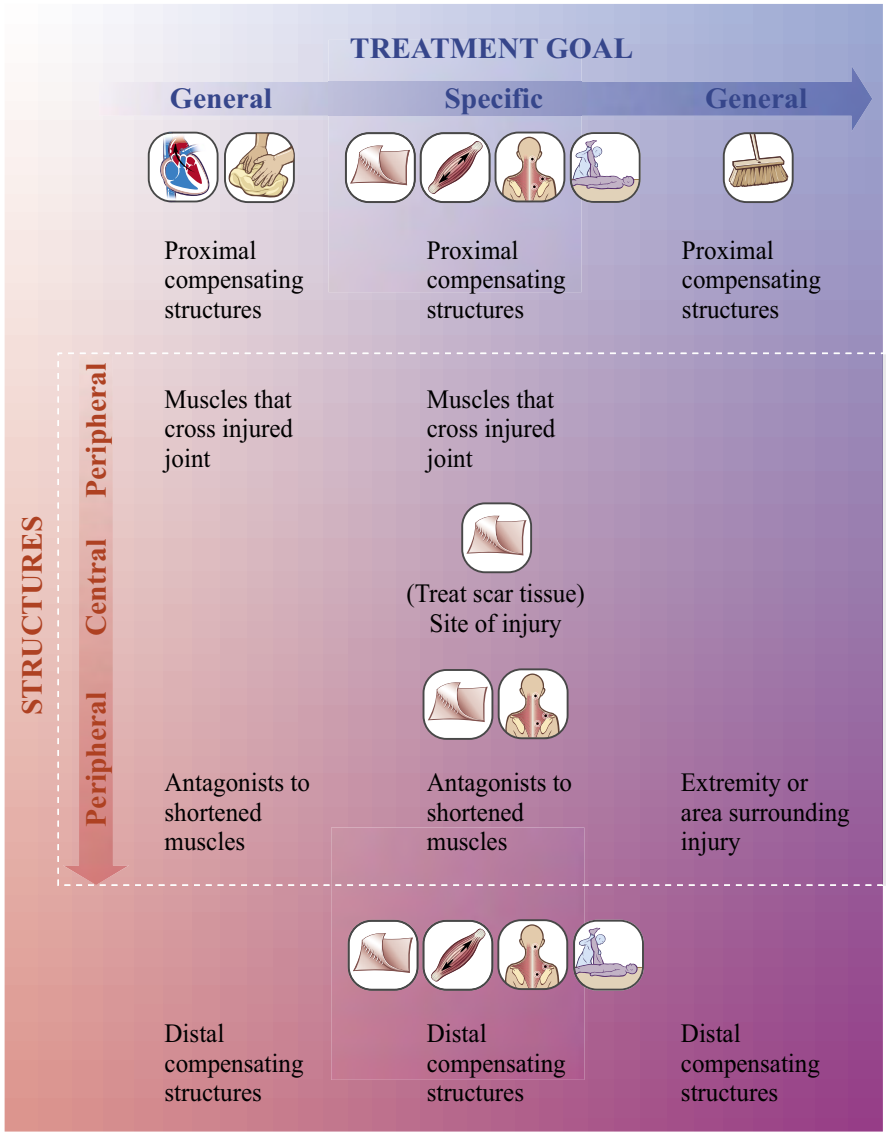

to realign the developing scar tissue in the functional direction. Alternate rounds of cross-fiber and longitudinal strokes until you feel a change in texture.

- Apply pain-free ROM techniques that gently stretch the ligament to further encourage re-alignment of the fibers. While it is important to use techniques that gently stress the ligament by increasing the distance between its attachments, take care not to overstretch the ligament to avoid re-injury.
- If the area became hot or began to swell while applying friction, apply ice for just a few minutes to reduce heat and swelling without overly chilling the area.



- Treat tissues distal to the injury for compensating patterns, if needed, and to increase circulation.

- Passively stretch or perform PIR to local, compensating muscles within the client's tolerance as necessary. This may require repositioning the client.



CLIENT SELF-CARE

Avoiding re-injury is a primary concern when recommending self-care. For clients with a grade 1 sprain in any stage, or a grade 2 or 3 sprain in the late subacute or chronic stage, the following suggestions may encourage proper healing.

These suggestions are intended as general recommendations for stretching and strengthening structures 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 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.

- Instruct the client to perform self-care throughout the day, such as while talking on the phone, reading e-mail, washing dishes, or watching television if this can be accomplished without stressing the injured ligament or compensating structures. This minimizes the need to set aside extra time.
- Encourage the client to take regular breaks from stationary postures or repetitive actions that may affect the health of a ligament or the joint it crosses. If the client's daily activities include hours of inactivity, suggest moving for a few minutes every hour to prevent adhesions and reduced circulation. If the client's daily activities require repetitive actions that contribute to sprains or compensating patterns resulting from sprains, suggest resting for a few minutes every hour.
- Demonstrate gentle self-massage of the tissues surrounding the injury to keep adhesions and hypertonicity at bay between treatments.
- 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 cause harm when practicing alone. In all stages of a sprain in any degree, it is essential not to stretch the joint to the extent that the injured ligament is overstretched or re-injured. In the chronic stage or when appropriate for a healing sprain, 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 or bounce. Stretching should be slow, gentle, and steady, trying to keep every other joint as relaxed as possible.
- Stretching and strengthening exercises should be recommended according to your findings in ROM testing and palpation.

Stretching

Depending on the severity of the injury, early mobilization and moderate, controlled stress to an injured ligament may aid the healing process. Mobilization increases circulation to the area, reduces adhesions, and helps to restore normal proprioception when performed within the client's tolerance. When possible, moving the injured joint to produce the shapes of the letters of the alphabet may help to restore and maintain mobility. Instruct the client to draw small letters, and to draw only as many letters as possible without feeling pain or excessive fatigue, taking care not to fully stretch the injured ligament. In the later stages of healing, recommend increasing the ROM by drawing bigger letters so that controlled but pain-free stress is placed on the joint.

Because muscles crossing the injured joint may also have been injured or may have responded to protect the joint, it is important to recommend self-care to aid in healing. For strained muscles, refer to the course on muscle strains. Muscles that have shortened to maintain stability in the joint may need stretching once their protective splinting is no longer necessary. The results of ROM testing and palpation will help you to determine which muscles have shortened and need to be stretched. Refer to previous chapters for stretches to specific muscles or groups of muscles. Take care to instruct the client to stretch slowly and to limit stretches to the comfortable range, gradually increasing the stretch as symptoms diminish and the risk of re-injury is reduced.

Strengthening

Strengthening weakened or atrophied muscles is equally important for restoring proper function of the affected joint. The results of ROM testing and palpation determine which muscles have weakened and need to be strengthened. In general, active or resisted concentric contractions strengthen muscles. As with stretching, a strengthening program should progress gradually. Pain-free, active ROM is effective for gradually restoring strength to weakened muscles. As healing progresses and the risk of re-injury diminishes, add resistance to active ROM by including weight-bearing activities. Refer to previous chapters for exercises to strengthen specific muscles or muscle groups.

SUGGESTIONS FOR FURTHER TREATMENT

In the acute stage, shorter treatments focused on reducing inflammation and increasing mobility are recommended until inflammation is minimal and the client can tolerate manual pressure to the tissues. A grade 1 sprain often heals in approximately 1 week, and treatments can be scheduled twice per week until symptoms subside. Grade 2 sprains can heal in as little as 2 weeks, but could take up to 6 weeks to heal well enough to return to activity without symptoms. Treatments can be scheduled twice per week until mobility and strength are restored, and weekly after that until compensating patterns are resolved. Grade 3 sprains, depending on whether the ligament is surgically repaired, may take up to 2 months to heal sufficiently to perform normal activities of daily living without symptoms. Depending on the progress of healing and complications, you may want to discuss the injury with the client's health care provider before initiating treatment. With proper clearance, treatments can be scheduled twice per week until mobility and strength are restored, and weekly after that until compensating patterns resolve.

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 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. Explain the importance of their participation in the healing process, and encourage the client to follow your recommendations, but be careful not to judge or reprimand a client who does not.
- The condition is advanced or has other musculoskeletal complications that are beyond your basic training. Refer this client to a massage therapist with advanced 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 client has an undiagnosed, underlying condition. 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 in just one treatment, it may encourage the client to discuss this change with a health care provider and seek manual 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 the superficial tissues in general areas, you may be able to focus more of your treatment on deeper tissues in a specific area. Likewise, once you have treated symptoms specific to sprains, you may be able to pay closer attention to compensating structures and coexisting conditions.

Professional Growth

Case Study

Adila is a 39-year-old mother of three. She has sprained her left ankle three times, each time toward the end of the second trimester of her three pregnancies. The last sprain was about 1 year ago. Since the first sprain, she has always been very protective of the ankle because she is worried that it is weak. After each of the three sprains, she was able to use the ankle without symptoms within a few days of twisting it, and until recently, she has had no limitations in mobility and no pain. Approximately 1 month ago, she began to feel pain in the ankle and lower leg when she walks long distances and when she climbs stairs, particularly when carrying a child, laundry, or other heavy load. Fearing the ankle would sprain again, she has been using a brace for stability. This decreases the level of pain in the ankle, but she continues feeling pain in the leg, creeping up toward the knee. She has also been feeling some discomfort in her lower back recently.

SUBJECTIVE

When asked, Adila explained that there was minimal swelling and bruising each time she sprained the ankle. She used ice each time, and after resting for a day, she continued activity with the ankle braced. She did not seek medical attention because she read on the Internet that if she was able to bear weight, had minimal swelling, and noticed improvement 48 hours after injury, there was little chance of a broken bone, and the sprain would probably heal on its own. She explained that she had gained more weight with her last pregnancy and has been unable to lose it as easily as with the first two. She described herself as being 20 pounds heavier than her normal weight. When asked, she described the pain she feels as a tightness that begins to fatigue after walking for about 5–10 minutes and when climbing up the stairs.

OBJECTIVE

Adila is not limping. When standing still, she carries her body weight on the right leg. The left hip is slightly more laterally rotated compared to the right. The right hip is slightly elevated. She has slight hyperlordosis. The ankle is slightly everted and dorsiflexed when not bearing weight. There is no hypermobility in the ankle. Active inversion and plantar flexion are reduced compared to the right ankle. Passive inversion is restricted without pain, and passive inversion and plantar flexion produced an "uncomfortable stretching feeling" along the anterior leg. Resisted inversion is weak. There is a small pocket of edema just anterior to the left lateral malleolus with minor, superficial adhesions along the inferior extensor retinaculum and significant adhesions with dense scar tissue along the anterior talofibular ligament. This area is tender to the touch. I found nothing remarkable along the calcaneofibular ligament. Tissues of the left anterior and lateral leg are dense and adhered. The iliotibial band is dense and adhered.

ACTION

The primary treatment goals include reducing adhesions along the anterior talofibular ligament and anterior lateral leg and reducing adhesions and lengthening the peroneus longus, peroneus brevis, and extensor digitorum longus. Future goals include reducing adhesions and density in the iliotibial band, reducing hyperlordosis, and leveling the pelvis.

I elevated the left leg to initiate drainage of the edema. I applied superficial strokes toward the lymph nodes at the ankle and knee to continue draining. I used general Swedish massage on the thighs and right leg while drainage continued. The pocket of edema reduced sufficiently to allow more specific palpation and treatment of the area. I applied myofascial release to the left anterior lateral leg and ankle. I used superficial and deep kneading to the full left leg with a focus on reducing adhesions along

the anterior lateral leg. I used muscle stripping to the peroneus longus, peroneus brevis, and extensor digitorum longus. I applied deep transverse friction to the anterior talofibular ligament followed by longitudinal strokes to reduce adhesions and scar tissue and to realign ligament fibers. I applied gentle mobilization of the left ankle with a focus on placing tensile stress on the anterior talofibular ligament. Each mobilization ended with inversion and plantar flexion of the ankle. Very localized heat and minor swelling developed along the ligament. I applied ice for approximately 5 minutes, followed by a minimal, general mobilization of the ankle.

I began releasing the superficial tissues of the left thigh, bilateral gluteals, and low back. The thoracolumbar fascia is dense and adhered. The right sacroiliac joint is less mobile than the left. The right quadratus lumborum is dense with a possible trigger point. I will return to these areas as time permits in subsequent visits. I will also assess the iliopsoas.

PLAN

I recommended self-care beginning with drawing the alphabet with her ankle. I instructed Adila to begin slowly, within her pain tolerance, and to only draw as many letters as she can before the leg feels weak or fatigued. After drawing the alphabet, I instructed her to walk around for approximately 1 minute, and then stretch the lateral leg by inverting the ankle within her tolerance, using external surfaces if necessary to feel a stretch along the lateral leg and ankle. As symptoms improve, I suggested she consider adding jumping exercises and activities that include criss-cross steps to continue strengthening the ankle and to restore proper proprioception. Adila rescheduled 4 days out to reassess the leg and continue with treatment if necessary and to assess the hips and low back and treat as necessary.

CRITICAL THINKING EXERCISES

1. Choose two joints and describe which muscles may be reflexively activated or inhibited if a ligament providing stability to that joint is injured. Remember that muscles that cross the joint may have a direct effect while muscles that do not cross the joint may have an indirect effect. Describe how reflexive activity in these muscles may protect the affected joint.
2. Your client started feeling pain in her wrist, particularly when she works at her computer. She believes she has carpal tunnel syndrome, but she has no tingling in her fingers and your tests are negative for carpal tunnel. She mentions that she fell off her bicycle about a year ago and hurt her wrist, but she did not have it evaluated at the time. Discuss the possible injuries that may have occurred when she fell that may mimic symptoms of carpal tunnel syndrome a year later. In what direction may the impact have bent the wrist? Which soft tissue structures may have been stressed? Is there a ligament sprain in the wrist that, if untreated, may produce symptoms in the chronic stage that resembles carpal tunnel syndrome? How will you treat this client?
3. Your client had a grade 3 complete rupture of the anterior cruciate ligament during a skiing accident 6 months ago. He opted not to have the ligament surgically repaired but had six sessions of physical therapy following the injury to restore ROM. He is able to walk without limping and has no pain in the knee but has been experiencing low back pain and pain along the spine. Describe how the injury may contribute to his current dysfunctions. Would compensating patterns contribute to back pain? Which muscles or other structures may have been affected during the healing process? There are many possibilities here, so take your time thinking about it, and be creative.
4. Discuss which ligaments might be affected in clients with the following chronic conditions:
    - Hyperkyphosis
    - Hyperlordosis

- Plantar fasciitis
- Piriformis syndrome
- Patellofemoral syndrome
- Tension headaches

5. Conduct a short literature review to learn about the relationship between chronic sprains and the following:

- Age
- Rheumatoid arthritis
- Osteoarthritis
- Generalized ligament laxity
- Thyroid dysfunction
- Down or Asperger Syndrome

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