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Soft Tissue Injuries 116

Hours 10-12

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Hour 10
Section 46: Treatment of the Thoracic Spine and Rib Cage after Acceleration/Deceleration Impact

Bones:

Osteoporosis:

Osteoporosis is usually an incidental finding on X-ray film or the patient will disclose this condition. Be conservative using manipulative therapeutics.

Costochondritis:

This inflammatory condition of the rib cartilage can occur from a seat belt injury or hit of an airbag. Treatment must decrease the inflammation and swelling. Ice is recommended as well as decrease in activity that could exacerbate.

Fracture:

Treatment for fractures is outside the scope of this course. Compression fracture especially with osteoporosis is the most common. There may be hairline fractures after acceleration/deceleration impact. If fracture is found, the patient is a medical emergency and must be taken to an emergency room immediately.
**Congenital defects:**

**Cervical ribs:** This anomaly can be asymptomatic or cause Thoracic Outlet Syndrome as the rib may compress neurovascular structures. A cervical rib can make the region more vulnerable after trauma to thoracic outlet syndrome.

**Scoliosis:**

After acceleration/deceleration impact, a more unstable spine can decompensate creating a scoliosis in flux. Ribs can twist and torque and be very painful to the patient complicating their recovery. Stabilizing the curve is of utmost importance. Identify regions of ligament and muscular tearing or microtears, trigger points, atrophy, spasm, spinal dysfunction and any foraminal compressions resulting from spinal torque and lateral bending. Atrophy is best treated with Russian stimulation, stretching, and strengthening exercises specific to the muscle group(s). Treatment for spasm can include bipolar interferential, galvanic, sine wave, strain/counterstrain, postisometric relaxation, massage, fascial release, ultrasound, or trigger point ultrasound.

Exercises for scoliosis:

- **46-1**
  *Pelvic tilt - supine, hips and knees flexed. The low back is pressed to the floor while the buttock is elevated for a count of 10.*

- **46-2**
  *Erect pelvic tilting - standing patient’s back is up against the wall. They press the small of their back and their neck against the wall while tilting their pelvis anteriorly.*
*Prone pelvic tilting - patient is on their hands and knees. They round their low back to reverse the lumbar lordosis.

*Isometric abdominal exercise - hips and knees bent. The patient raises their shoulders with the back pressed against the floor and holds the contraction for a count of 30.

*Lateral flexion and derotation of the thoracic spine - patient on their knees. With their hands in front of them, they laterally bend their body into the apex of the curve to stretch the muscles on the concave side.
*Back extension swim - the patient raises their arms and legs above them and off the floor while they are prone.

*Crawling exercise - patient is on their hands and knees. They cross crawl with their back into extension, then flexion.

* Psoas stretch can be performed in several ways; active (standing, lunges), or passive (postisometric relaxation, supine stretch).

**Joints:**

**Capsular lesions:**

Minor sprains can be treated with ice, EMS to reduce inflammation varying from microcurrent for one joint to interferential for a greater area. With an intact capsule, once inflammation has receded, gentle mobilization and manipulation can be introduced. Cold laser can reduce inflammation. Range of motion exercises are beneficial after swelling has receded. Caution should be used with moderate tears. Until, stabilization of the region, non force manipulative therapeutics should be a priority. Severe capsular tear could present with dislocation and is out of the scope of this course.

**Osteoarthritis:**

Patients with DJD as a complicating factor may present with immobility of flexion. The flexor muscles become shortened, hardened and thickened as the extensor muscles become thin and atrophied leading to hyperkyphosis and other postural anomalies. Treating the pain, muscle
spasm, loss of motion and possible neurological and vascular deficits is necessary. Once the inflammation has been decreased, wet heat increases blood flow. Active stretching may be difficult as muscle splinting is common. Passive stretching and post-isometric relaxation can assist. Exercise for a few minutes twice daily is more effective than intense exercise 1-2/week. EMS, ultrasound and massage can aid with muscle spasms. Russian stimulation is good for atrophied extensor groups. Mobilization and manipulation can be performed but with osteophytes or spondylophytes, there is a risk of neurological or vascular complication and non-force or low force techniques are preferred.

*Rheumatoid arthritis:*

Be wary in treatment with a RA patient. Trauma to their already weak ligaments can cause severe instability especially to the transverse ligament. Non force techniques and mild mobilization are preferred. Skin fragility can be due to steroid use.

*Vertebral and Rib Joint Dysfunction:*

Risk factors for manipulation include neurological and vascular implications as well as possible ligament tear. Corrections are a rehabilitation of joint proprioception, ligamentous and muscular scar tissue, muscular spasm, adhesions and trigger points. Be wary of nerve root compression from osteophyte formation, disc degeneration and foraminal encroachment. These conditions may contraindicate quick adjustive thrusts and a more low force technique may be preferred.

Acute joint dysfunction benefits from ice, gentle passive stretch, strain/counterstrain, post-isometric relaxation, and EMS. Once inflammation has been decreased, spinal manipulation can be introduced if not contraindicated.

Secondary complications of muscle spasm, atrophy, trigger points and loss of joint motion must be addressed. Wet heat, stretching, strain/counterstrain, post-isometric relaxation, EMS, ultrasound, trigger point ultrasound, massage are all effective. Exercise strengthens the areas once proper biomechanics have been restored.

Lawrence H Jones, DO, *Strain-counterstrain* has developed treatment protocol for the thoracic spine and rib cage vertebral segment dysfunction.
Posterior thoracic spine points:

*Posterior points* T1-3 are treated with the patient’s arms dropped over the sides of the table, their head supported by cupping the chin. The spine is placed in extension to the segment. Rotation and side bending are minimal and usually away from the offending side.
Posterior points T4-6 are treated the same as above but the patient’s arms are placed overhead moving the angle of the spine for effectiveness.

Posterior points T7-9 is as T4-6 but with support under the chest to raise the spine.

Posterior points T10-12 require support under their chest. Rotation is accomplished by grasping their pelvis at the ASIS and rotating it 45 degrees. Any deviation of the spinous process, the patient’s shoulder can be lifted to accommodate.
Lateral posterior thoracic points:

These exhibit greater tenderness and found midway between the spinous and transverse process. The treatment is consistent for points 1-12 with the patient prone. Their arm of the affected side is near their head with side bending away with slight rotation toward. Their face is turned toward the side of pain. Contact their arm under the axilla and pulls cephalid.

Anterior thoracic points:

Anterior points T1-7 are on the sternum at the midline.

Anterior points T8-11 are on the abdomen at the midline.

Anterior point T12 point is found laterally over the ASIS.
Anterior point T1 is on the suprasternal notch, point T2 is on the manubrium. Treat with the patient’s upper back against the practitioner’s chest with their arms over head. Flex the patient’s neck and press cephalid.

Anterior points T3-4 are at the level of the corresponding costal cartilage and is treated as points 1-2 but the patient’s arms are in extension and internal rotation as they are pushed into flexion.
Anterior points T5-8 are treated with the patient’s upper back against your thigh, and flexion is accomplished for the level being treated. Anterior point 5 is above the xiphoid, point 6 is at the xiphoid junction, point 7 is at the tip of the xiphoid and point 8 is below it.

Anterior points 9-12 are treated with the patient supine, their pelvis in flexion (supported) and their knees drawn to their chest.

Anterior lateral points are found at levels 5-8 and are at the costal cartilages close to the side of the sternum. The treatment is flexion, ipsilateral bending and contralateral rotation. The patient is seated with their arm over your knee on a pillow, their head resting on the pillow. Allow for lateral bending and flexion corresponding to the vertebral level.
Costovertebral points:

These are usually associated with intervertebral points because they tend to occur together. The most significant points are the top five with occasional attention to the 8th and 10th regions. Usually, more tender points are treated first but with the costovertebral points, Dr Jones recommends treating the intervertebral points before the costovertebral. Two conditions addressed are depressed ribs defined as those relieved by depression and elevated ribs relieved by elevation.

Depressed rib 1 - its point is below the clavicle lateral to the sternum.

Depressed rib 2 is 1 ½ inch below the clavicle. With the patient supine, lifts their head and neck to 40 degrees, rotating and laterally bending it towards the painful side. Although these points are anterior, the patient’s symptomatology is posterior.
Depressed ribs 3-8 – their points are on the anterior axillary line. Treatment is seated with ipsilateral bending, contralateral rotation and some flexion.

Elevated 1st rib point is located on the rib at the base of the neck at its superior surface near the spinal attachment. With the patient seated, their neck is in extension and slight ipsilateral rotation.
Elevated 2nd rib point is found posteriorly and the patient is seated with their neck in flexion and rotation toward the painful side.

Elevated ribs 3-6 are treated posteriorly and are located by moving the scapula laterally (patient places their arm across their chest). These ribs will be less prominent upon palpation as opposed to depressed ribs which appear more prominent. With the patient seated, they are laterally flexed and rotated away from the painful side.

Dislocation is a serious medical emergency and out of the scope of this course.

Section 47: Treatment of the Thoracic Spine and Rib Cage after Acceleration/Deceleration Impact (continued)

Joints (continued):

Vertebral Joint and Rib Dysfunction (continued):
**Intervertebral disc disease:**

Minor disc protrusions can be conservatively treated depending upon location. Manipulative techniques should be used to treat this patient only when the condition is mild. With positive nerve root findings in mild cases, traction and ice can be affective. Microcurrent can decrease inflammation of local tissues. For secondary muscle involvement, gentle range of motion and stretching can be applied.

**Intervertebral foramen compression:**

Inflammation around a nerve root can be reduced by ice, traction, microcurrent, fascial release, and cold laser. Vitamin B6 and magnesium have been found to reduce inflammation of nervous tissue. Manipulative therapeutics can be affective but be wary of osteophytes.

**Ligaments:**

Mild ligament sprain can be treated effectively with ice, cold laser, and microcurrent until the swelling subsides; then interventional or biphasic or ultrasound and wet heat. Moderate sprain can be treated as above but with a supportive brace such as rib or thoracolumbar belt. Severe sprain is usually a surgical condition. Once inflammation subsides, mobilization and/or manipulation can be used if not contraindicated. For mild sprains, manipulation can be introduced within the first week. For moderate sprains it is wiser to wait until swelling has subsided and ligaments are more stable. For severe sprains, after surgery and swelling has subsided, mobilization is recommended first, then manipulation if necessary.

**Muscles:**

Protocol for acute and chronic conditions below are as discussed in *Note in section 42: Treatment of the Cervical Spine After Acceleration/Deceleration Impact.*

**Chest muscles:**

**Pectoralis major:**

This muscle can be injured from a seat belt, when the arm is raised at impact and as a reaction to injury to the arm or shoulder.

**Acute:**

*Stretching:

**Passive:** With patient supine, their arm is off the table in abduction and external rotation. Contact their arm and stretch it to the floor (about 10 degrees extension). For the clavicular division, the patient’s arm is abducted 70 degrees. For the midsternal division, the arm is abducted 90 degrees. For the lower sternal division, the arm is abducted 110 degrees.
Active: With patient standing, they place their forearm and palm against a door frame and step forward.

Postfacilitation: The patient is supine, their arm internally rotated (hand on abdomen), elbow flexed.
*Lower sternal division – patient brings the shoulder forward against the practitioner’s resistance directed posterior-inferior.
*Midsternal division – practitioner’s resistance directed to the floor.
*Clavicular division – practitioner’s resistance directed laterally and caudally.

Chronic:

*Friction massage - Two regions can receive friction massage; fibers at the medial inferior border of the clavicle (direction is medial to lateral and back). Fibers attached to the bicipital groove of the humerus (contact is two inches toward the belly of the muscle, the direction is superior-lateral to inferior-medial and back).

*Post-isometric relaxation – Trigger points are located in the muscle belly near the humerus. The patient is supine with their arm dropped off the side of the table in abduction and external rotation. For the midsternal and lower sternal divisions, the patient’s arm is at 130 degrees for the isometric phase and 100 degrees for the relaxation phase. For the clavicular divisions, the patient’s arm is at 100 degrees for the isometric phase and 70 degrees for the relaxation phase.

*Ultrasound – Trigger point ultrasound can be performed on the attachments to the humerus. Do NOT direct the current toward the thorax.
*Exercise – With the patient supine, light weight can be used. The patient begins with their arms externally rotated and in abduction 70, 90 and/or 110 degrees, and brings their arms into horizontal adduction.

*Pectoralis minor:

**Acute:**

*Stretching:

With the patient standing, they interlock their fingers behind them, palms down and extend their chest. This then progresses into an internal rotation of the arms. It can also progress into extension of the arms. The arms can be extended to reach an object parallel with the scapula.

**Chronic:**

*Friction massage – With the patient’s arm in external rotation, the tendon of the pectoralis minor can be reached inferior to the coracoid process. The action is horizontally back and forth.

*Post-isometric relaxation – With the patient on their side, neck in flexion, their arm is internally rotated and extended. The isometric phase is 20 seconds of increased extension.
*Ultrasound – Continuous ultrasound is contraindicated due to the proximity to the thorax. There are two regions of trigger points (near the coracoid, near the rib attachments) that radiate pain into the anterior shoulder, medial arm and hand into 3rd – 5th fingers. Trigger point ultrasound can only be done near the coracoid process but the sound head must be directed away from the rib cage. Accessibility is best with the patient’s arm in extension, external rotation and abduction.

*Exercise:

Isometric: The patient places their anterior shoulder against a door and pushes. 
Isotonic: With the patient supine, arms overhead, palms up with light weight, they can bring their arms forward toward their abdomen.

**Rib Cage Muscles:**

*Intercostalis (external, internal, innermost, subcostalis and levator costorum):*

The intercostal muscles are vulnerable. Tear is rare, however, with severe injury and possible rib fracture is possible. Acute injury should be treated with ice. Cold laser is useful. Immobilization with a rib belt is only necessary with severe pain, rib fracture or intercostal neuropathy.

Strain/counterstrain can be introduced for spasm of an intercostal muscle. Shorten the muscle by laterally flexing the torso to approximate the ribs. Rotation of the torso can be added to lateral flexion depending upon which direction the intercostal muscle fibers are running. For the intercostalis external, rotation is downward and forward. For the internal and innermost, rotation is upward and backward.

Chronic injury can be treated with wet heat, stretch, strain/counterstrain, and massage. EMS is NOT recommended. Continuous ultrasound can be performed on the posterior fibers.
Transversus thoracic and sternocostalis:

Contusion is possible after injury. Treat with ice for acute conditions and wet heat for chronic conditions. Electrotherapy should not be performed.

Muscles of the posterior abdominal wall:

Diaphragm:

Difficult to reach, it cannot be treated by ice, heat, electrotherapy, cold laser or standard massage techniques. It can be stretched as follows:

With the patient standing against a wall, their feet about 6-9 inches from the wall, use fingertips to contact below their costal margin. The section of diaphragm involved can be identified by palpation as spasticity or Applied Kinesiology. The patient takes a deep breath, reach under their rib cage and pull downward as they completely exhale. The patient then inhales as the diaphragm is held and stretched even further as they completely exhale, then gently thrust downward. Repeat if needed to other diaphragm sections.

Psoas:

This hip flexor has direct association with the diaphragm. Acute or chronic contraction can pull on the diaphragm and vice versa. Psoas spasm is a very common cause of low back pain and is common after acceleration/deceleration impact.
Acute:

*Ice – the best posture to ice the psoas is with the patient’s leg in a figure “4”.

*Stretching:

Passive - with the patient supine, leg in figure “4”, contact the ASIS with the superior hand (palmer surface – fingers pointing inferior); inferior hand is placed on the inguinal ligament resulting in the hands opposing one another. Superior hand presses the ASIS laterally while inferior hand stretches the structures under the inguinal ligament laterally and inferiorly.

Active - standing – patient places the contralateral foot on a chair and supports themselves. The stretch is forward and downward, keeping their back straight.
Lunging – There are two stretches; with their ipsilateral knee on the ground, the patient places their contralateral foot in front of them, knee flexed 60 degrees. The movement of the pelvis is forward and down as the patient maintains their spine upright.

*Postisometric Relaxation*

**Supine:** Drop the leg of the involved side over the side of the table. Press downward and laterally on the thigh as they resist. Repeat three times.

**Prone:** Lift the involved leg up and slightly abduct until the patient cannot stretch any further. Counter stabilize the opposite pelvis. The patient resists the upward and abducted pull for a count of eight. Repeat three times.

**Chronic:**

*Wet heat – best done with the patient’s leg in a figure “4” posture.*

*Somatic Technique – With the patient supine, their feet 18 inches apart, grasp the knee on the offending side with the superior hand. The inferior hand holds their foot. The patient’s knee falls laterally to slightly flex the hip and knee and laterally rotate and abduct the hip. The patient’s knee is moved toward their opposite shoulder and the patient is instructed to further move their knee toward their shoulder as they resist for several seconds. The contraction is released 1/3 of the way while the practitioner maintains resistance. The patient moves their knee back toward
their shoulder against increased resistance. Repeat twice until the patient’s lateral knee is against the table.

*Strain/counterstrain – See acute iliacus below.

*Ultrasound – Trigger point ultrasound is the best means for releasing scar tissue and adhesions in a chronically spastic psoas. Trigger points are common in the attachment to the lesser trochanter and in the body of the muscle. Perform with the patient supine, their leg in a figure “4” position.

*Manipulation of the coccyx has been shown to have an effect on the psoas. Treat the coccyx outside the body with low force techniques.

*Exercise – walking up stairs, hiking, lunges from a standing position or elliptical trainer.

Section 48: Treatment of the Thoracic Spine and Rib Cage after Acceleration/Deceleration Impact (continued)

**Muscles** (continued):

**Iliacus:**

It is difficult to isolate this muscle due to its association with the psoas. Most techniques that treat the psoas muscle affect the iliacus. Alterations in leg and pelvic positions during treatment can better affect the iliacus. For postisometric relaxation and prone stretching, the hip should be abducted more than it would to treat the psoas. For trigger point ultrasound, include the region medial to the ASIS and iliac crest.
*Strain/counterstrain:

[Image 177x517 to 441x692]

The area for treatment is deep in the fossa of the ala of the ilium two inches medial and slightly below the ASIS. Treat bilaterally even though the spasticity may be unilateral. With the patient supine, their hips are flexed and externally rotated, knees are flexed and their feet crossed at the ankles. Hold this position for 90 seconds and release completely passively.

*Quadratus lumborum:*

**Acute:**

*Stretching – passive stretch can be done with the patient prone. Contact the muscle laterally by the rib cage and with opposing movement, stretch.

*Postfacilitation stretch:

[Image 198x147 to 444x310]

With the patient on their contralateral side over a 5 inch cylinder at their iliac crest, they lift both legs. Apply cross hand traction superiorly and inferiorly for 7 seconds as they resist. The patient relaxes as you apply 12 seconds of traction. Repeat twice.
**Chronic:**

* Mobilization and manipulation of the lumbopelvic spine.

* Exercise – back extension.

* Serratus anterior and serratus posterior (superior, inferior)

**Acute:**

* Stretch: With the patient standing, they abduct, externally rotate and extend arm while laterally bending away from the affected side.

**Chronic:**

* Post-isometric relaxation – Trigger points are nearest to the ribs. They radiate to the inferior of the scapula and medial arm, palmer surface of the hand and fingers. With the patient on their side, superior hip flexed, knee bent, their arm is in abduction, external rotation and extension. The isometric phase is in less extension than the relaxed phase.

* Latissimus dorsi:

**Acute:**

* Stretching – standing or lying down. The patient brings both arms in front and laterally bends their torso away from the affected side.
*Strain/counterstrain - Contact point is at the front of the humerus. With the patient supine, their arm hangs off the table. Internally rotate their arm while holding the point for ninety seconds.

*Somatic Technique – With the patient on their side, hip and knees bent, take their arm over head and pull upward. There should be movement between the scapula and the rib cage.

**Chronic:**

*Friction massage – The insertion of the latissimus dorsi is at the medial aspect of the bicipital groove. The direction of massage is distal to proximal and back.
*Post-isometric relaxation – With the patient on their side, they bring their arm overhead and posterior to their head with the elbow bent and forearm hanging over the table. For the isometric phase, the patient raises their arm to where their shoulder is touching their ear.

*Ultrasound – Continuous or trigger point ultrasound – Trigger points are at the arm attachment and in the muscle belly at the lower ribs. Pain radiates to the lateral flank and/or anterior shoulder, and to the back near the inferior scapula border and down the arm posteriorly and medially.

*Massage.

*Cold laser.
*Exercise – band work. With the bands secured overhead, the patient grasps them and pulls downward.

*Spinal Manipulation

_Rhomboïds_

Acute:

*Stretch: With the patient standing, they clasp their hands in front of them, palms out and rounding their back, they push an imaginary wall.

*Strain/counterstrain – With the patient prone, contact the most tender point in the muscle and bring the patient’s shoulder posterior and superior by grasping their anterior shoulder.

Chronic:

*Ultrasound – continuous or trigger point.

*Exercise – With the patient prone, arms off the table, light weights can be pulled up with a gentle shoulder shrug. With the patient standing, light weights in each hand, elbows bent, the patient brings the weights up and back.

_Trapezius:_

_Middle trapezius:_

Acute:

*Stretching – Active stretching as rhomboids.

*Strain/counterstrain – Same as rhomboids.
**Chronic:**

*Continuous or trigger point ultrasound. Trigger points are found in the belly or lateral scapula spine attachment. Radiation pain patterns are to the lateral arm and forearm.

*Exercise – With the patient prone, their arms to the sides, palms down, they raise their arms up retracting their scapulae.

**Lower trapezius:**

**Acute:**

*Stretching - with the patient standing, they clasp their hands in front of them, palms out and push an imaginary ledge above them rounding their back.

**Chronic:**

*Ultrasound – continuous or trigger point. Trigger points are found in the muscle belly and radiate to the scapula and lateral arm.

*Exercise – With the patient prone, their arms to their sides, 120 degrees to their torso, they posteriorly lift their arms into extension and decrease the angle to the torso to 90 degrees.

*Splenius capitus, splenius cervicus, longissimus and semispinalis* previously covered under *long extensors* in Section 42: Treatment of Cervical Spine After Acceleration/Deceleration Impact.

*Sacrospinalis and iliocostalis* (erector spinae)

**Acute:**

*Stretching – From the seated position, the patient can drop their torso forward. From supine, the patient can grasp their knees and lift their shoulders off the floor creating a “C” position.

*Postfacilitation stretch – 2 methods:
Supine: Patient’s hips are flexed, contact their sacrum, palpate the erector spinae while the patient contracts the muscle group by anteriorly tipping the pelvis for 7 seconds. The patient releases, then flex the patient backwards pressing downward on their legs for 12 seconds. For the upper thoracolumbar region, increase the angle of flexion.

Prone: With their pelvis off the end of the table, lower extremity off the floor, contact the sacral base and upper lumbars in a cross handed position. The patient tilts their pelvis anteriorly against resistance. The patient bends their knees and lifts their legs as the contact is held for 7 seconds. The patient relaxes and lets their legs down as pressure is maintained. For the thoracolumbar region, the patient moves down toward the edge of the table.
Chronic:

*Exercise – Back extension. This can be done as an isometric “Superman” hold for 20-30 seconds. The torso or torso and legs can be raised for many repetitions.

Multifidus:

Chronic:

*Stretch in flexion.

*Exercise – back extension with ball, isometric as in “Superman” hold or repetitions with torso in extension or torso in extension and legs lifted.

Spinalis, rotatores, interspinalis and intertransverse:

For acute situations; ice, microcurrent, ultrasound or cold laser. For chronic conditions; wet heat, microcurrent, trigger point ultrasound, deep tissue release, cold laser and manipulation.

Scalenius (anterior, medius, posterior): Treatment for these muscles were previously covered under long flexors in Section 42: Treatment of Cervical Spine After Acceleration/Deceleration Impact.

Rectus abdominus, external oblique, internal oblique, transversus abdominus:

*Stretch – back extension on a ball with the patient’s arms over head.

*Exercise:

Crunches – The key to a crunch is to make sure that the patient presses the small of their back against the floor. Their shoulders only need to be lifted off the ground three inches. There are
many variations: The patient can lift their legs, knees bent; they can lift their legs, knees straight; they can criss-cross their body, elbows to knees as in a bicycle motion. Lateral crunches can also be done.

The patient can do sit ups on a ball.

They can be seated on the ball and lift one leg at a time.

They can be prone on the ball with the ball under their thigh and hold this position isometrically or walk their hands moving the ball under their thighs.

Plank - the patient can be prone on their toes and elbows and hold this posture for a minimum of 30 seconds.

**Bursa:**

Scapulothoracic bursitis can be treated for acute inflammation by ice, cold laser and electrical muscle stimulation. Once inflammation has reduced, ultrasound, massage and stretching can be
added. Lateral bending with the arm overhead is the most affective stretch to reach the tissues under the scapula associated with this bursa.

**Nerves:**

**Costoclavicular compression:**

Treat the scalene and/or pectoral muscles if spastic. Mobilize or manipulate the 1st rib and clavicle and/or cervical spine.

**Peripheral neuropathy:**

Identify the compression level and reduce pressure at that level. For nonsurgical cases, traction, fascial release, and correction of vertebral dysfunction are important. For secondary effects of nerve root compression reduce inflammation and muscle spasm. Strength training is crucial for rehabilitation.

Treatment for *spinal cord lesions* was covered in section 43: Treatment of Cervical Spine After Acceleration/Deceleration Impact.

**Blood Vessels** and **Viscera:**

*Embolism* secondary to fracture, *aneurysm, pneumothorax* from rib fracture puncture or air bag strike are medical emergencies and out of the scope of this course. However, it is important to recognize the conditions as emergencies and refer appropriately.

**Fascia:**

The fascia of the abdominal wall and transversalis fascia cannot be treated by conservative means due to their proximity to abdominal organs. The iliopsoas, pectoral, and fascia of the deep back muscles fascia can be treated by conservative means. The most effective means to treat scar tissue and adhesions in fascia is with trigger point ultrasound and deep tissue massage. Fascial release is highly affective with local compression syndromes.

Scapula mobilization can be beneficial in releasing scar tissue and adhesions that form under the scapula preventing movement and affecting the upper extremity and thoracic spine. With the patient prone, the dorsum of their hand at the small of their back, lift their scapula up off their rib cage with the cork of your hand. Rotate the scapula in varying directions as it is lifted to release adhesions.
Section 49: Treatment of the Lumbopelvic Spine after Acceleration/Deceleration Impact

*Bones:*

*Stenosis:*

This can be due to a congenital narrowing of the spinal column, DJD or disc disease. A dormant condition can be exacerbated by acceleration/deceleration impact. Mobilization can be used with mild conditions. More severe conditions are surgical.

*Spondylolisthesis:*

An acute trauma could worsen this condition or trigger symptomatology. Depending on the grade, treatment can be conservative or surgical. Since the L5 body cannot be reached manually, the sacral base can be moved anteriorly with a posterior contact on the sacral base and an anterior thrust. Also, with the patient supine, their hips and legs flexed, their pelvis is lifted off the table. Contact and move the sacral base downward and anterior.

*Tropism:*

This complicating factor creates instability. Opposing facets can develop inflammation and degeneration from aberrant movement. Facet syndrome, DJD, ligament sprains and trigger points can develop. They patient should avoid heavy lifting with twisting. Treatment is specific for the particular findings at the joint site.

*Transitional Vertebra:*

Lumbarization and/or sacralization are complicating factors. Treatment to stabilize the region is necessary. Assist the patient with healing and life style changes in which certain movements are avoided such as heavy lifting with a twist or certain sports.

*Scoliosis:*

This complicating factor was previously covered in Section 46: Treatment of the Thoracic Spine and Rib Cage after Acceleration/Deceleration Impact.

*Joints:*

*Capsular lesions:*

This condition is common after acceleration/deceleration impact and was previously covered in Section 41: Treatment of the Cervical Spine after Acceleration/Deceleration Impact.
Osteoarthritis and Rheumatoid arthritis:

These conditions often complicate injuries from acceleration/deceleration impact and were previously covered in Section 46: Treatment of the Thoracic Spine and Rib Cage after Acceleration/Deceleration Impact.

Intersegmental dysfunction:

Lumbar spine:

Contraindications for manipulation set out by JH Cyriax, MD are:
- spinal cord signs
- impingement on the 4th sacral root including numbness or weakness of the bladder or anus
- pain at the perineum, rectum and scrotum
- bilateral sciatica without backache
- spinal claudication
- anticoagulants.

Acute intersegmental dysfunction benefits from ice, passive stretch, strain/counterstrain, post-isometric relaxation, and EMS to reduce spasm and joint swelling. Once inflammation decreases, spinal manipulation can be introduced in either non-force, low force or, if not contraindicated, manipulative thrusts.

There are two treatments that are usually not well known that deserve attention; these are anterior L5 and posterior L3.

Anterior L5 correction is a distinction for L5 that has fixated in flexion. This is found with a low back that will not stabilize. Once verified, the patient is supine. Contact the anterior of L5 by compressing the abdomen over the region of L5 body. An assistant tractions and pulls the patient’s legs at the same time you gently press on the anterior of L5. This correction seems mild but is very affective.
Posterior L₃ (or L₃ fixed in extension) can be found when the region below is difficult to stabilize. Biomechanically, L₃ is the most mobile segment in the lumbar spine and a simple drop piece P-A thrust can resolve many unstable low back pain syndromes.

**Pelvis:**

Many tools can evaluate and correct pelvic instability. Muscle testing can identify weak muscles. Strain/Counterstrain can treat spastic muscles. SOT is a powerful technique to stabilize the pelvis. Please refer to Sacro-Occipital Technique 101, Linda Simon, DC for a complete description of the theory, diagnosis and treatment protocol for this technique.

Motion palpation is an important evaluation tool. If motion palpation has determined that the right PSIS does not move upon lifting the ipsilateral leg, this is a flexion fixation of the right sacroiliac joint. If the sacral base does not move upon lifting the contralateral leg, this is an extension fixation of the right sacroiliac joint. The same applies for the lower sacroiliac joint.

The treatment of the pelvis after motion palpation has been completed is as follows:

An upper sacroiliac joint fixed in flexion requires force to move the ilia anteriorly. An upper sacroiliac joint fixed in extension requires the sacrum to be moved anteriorly. This would be a sacral base contact. A lower sacroiliac joint flexion fixation demonstrates no ilium movement upon motion palpation and the ilium would be adjusted anteriorly with the contact at the PIIS or the ischial tuberosity. A lower sacroiliac joint extension fixation requires the sacral apex to be moved anteriorly as the contact would be closer to the sacral apex. This could also be adjusted involved side up or down.

The sacrum can be manipulated as a unit if there is bilateral extension fixation. For the upper sacroiliac joint, contact the center of the base. For the lower sacroiliac joint, contact the apex. Sacral counternutation correction is given side posture, hip flexed 90 degrees which forces the sacrum posterior. Contact the multifidus with the forearm on the sacrum, the thrust is inferiorward toward the apex.
Sacral torque is the sacrum fixed relative to the ilia in a clockwise or counterclockwise rotation. The superior side of the base must be adjusted inferiorly to correct this torque. The inferior aspect of the apex can be manipulated superiorly as well.

Sacral pivot is the sacrum pivoted about a sagittal axis where the one side of the base is more anterior that the other side of the base. The more posterior side of the base must be corrected anteriorly to compensate. The correction can also be performed at the apex but is more affective at the base.

An ilia internally rotated on the vertical axis is usually corrected with a lateral thrust on the PSIS or a medial force to the ASIS.

An ilia externally rotated on the vertical axis is corrected with a medial thrust on the PSIS or a lateral force to the ASIS.

A flare out ilium is a situation in which the superior of the sacroiliac joint has a greater gap resulting in compression of the lower sacroiliac joint.

A flare in ilium is a situation in which the lower sacroiliac joint has a greater gap and the upper sacroiliac joint is compressed.

Sacrococcygeal joint distortion can be flexion, extension, rotation or lateral distortion. Correct with a low force or non force adjusting tool. Psoas spasm can be associated.

A pubic symphysis distortion is best treated with a non or low force adjusting tool.

**Strain-counterstrain** treatment protocols for the lumbar spine and pelvis are as follows:
Posterior lumbar points:

*Posterior lumbar point L5 (PL5)* is treated first since those points for L4 and L3 may subside as well. Contact the superior medial edge of the PSIS and lift the thigh into extension about 15 degrees.

*Posterior lumbar point L3 (PL3)* is midway PL5 and PL4, one centimeter posterior to the attachment of the TFL and midway between the iliac crest and greater trochanter. Extend the thigh 25 degrees about 6 inches above the knee.
Posterior lumbar point L4 (PL4) is described as above. Contact this point and lift the patient’s knees 20 degrees with the hand 3 inches above the patient’s knee.

Lower pole L5 is located an inch below the PSIS. With the patient prone, their affected leg side is off the table with the femur vertical and knee pushed slightly under the edge of the table top.
Spinous process points L1-L5 are treated prone. The patient’s low back is rotated toward the side of pain. Grasp the ASIS and rotate the pelvis 45 degrees.

Anterior lumbar points:

AL1 is one inch medial to the ASIS. Rotate the patient 60 degrees toward you and away from the affected side. Their hips and knees are flexed 90 degrees. Any discomfort from the position can be alleviated with pulling behind the flexed knee.

AL2 is contacted one inch inferior to the ASIS and one inch medial. The position is as above.
AL3 and AL 4 are one inch inferior to the ASIS; AL3 is more lateral, AL4 is more inferior. With the patient’s knees and hips flexed 90 degrees, their legs resting on your knee which is on the table. Pull the patient’s feet away from the involved side to produce lateral bending.

AL5 contact is on the front of the pubic bone near the pubic symphysis. The patient’s knees and hips are flexed; the knees 90 degrees, the hips at 135 degrees. The knees are pulled a little toward the side of pain.
Abdominal lumbar 2 point is performed like the AL2 point but the contact is in the abdominal wall 2 ½ inches lateral to the umbilicus and a half inch inferior. The patient’s thighs are flexed 135 degrees, their knees are flexed 90 degrees resting on your knee. Rotate the patient toward the affected side and laterally bend them away from the side of pain by lifting their feet with your knee.

Section 50: Treatment of the Lumbopelvic Spine after Acceleration/Deceleration Impact (continued)

*Joints* (continued):

*Strain/Counterstrain* (continued):

*Pelvic Points*:
**High (posterior) ilium** - the point is against the lateral PSIS. Extend the prone patient’s thigh and rest it on yours which is on the table. Hold the patient’s leg below the knee and lift to extend the ilium on the sacrum. The femur is adducted or abducted for the position of most comfort.

![Image 50-2](image)

**High ilium with flare-out** – this point is 1 ¾ inch below and ¼ inch medial to the PSIS. The prone patient’s thigh is extended and pulled back behind the other leg as you hold their knee.

![Image 50-3](image)

**Low (anterior) ilium** – patient is supine, their knees and hips flexed. The point is on the superior surface of the pubic bone about 1 - 1 ½ inches from the midline. Pain is usually in the back or side of the hip or thigh.
Low ilium with flare out – patient is supine. The point is in the perineum on the medial-inferior side of the pubic bone. Their hip is flexed, abducted and externally rotated resting their foot on your knee.

Sacroiliac flare in – patient is prone with leg abducted. The point is at the middle of the gluteus maximus about 4 inches below the PSIS.

Dislocation is a serious medical emergency and out of the scope of this course.

Intervertebral disc disease:

The extent of disc matter compromising neurological structures should be determined by MRI, CT or both. Minor disc protrusions can be treated conservatively with mobilization depending upon location.

There are two techniques for mobilization of the disc that are very affective; disc pump and flexion/distraction:
Disc pump is performed with the patient on their side, affected side down. Their torso is perpendicular to the table, hip and knee bent to 90 degrees. The spinous is contacted with a broad base palm contact and gently pumped 3-4 times P-A on the patient. Although this seems inadequate for the condition, it is a very affective technique.

Flexion/distraction is usually performed with a flexion pelvic piece and straps for ankle stabilization. The segment above the disc involved is contacted with a broad base palmar contact. The patient’s hips are flexed by contacting their legs and pushing down on the moveable flexion piece. The pelvic piece can be laterally bent and/or rotated to account for the position of the disc protrusion. Avoid rotation. This can be performed on flat bench tables with a roll or pillow under their pelvis.

**Intervertebral foramen compression:**

Inflammation around a nerve root can be reduced by ice, traction, microcurrent, fascial release, and cold laser. Manipulation can be affective but osteophytes will define if the procedure will be low force.

**Facet syndrome:**

Reduce inflammation with ice, interferential current, galvanic current, or microcurrent if localized. Joint fixations can be addressed with mobilization or manipulation as long as the posterior facets are placed in flexion for the relief of extension compression. Address muscular and ligamentous involvement.

James H Cyriax, MD devised a treatment protocol for the low back using manipulation. He categorizes his findings into **rotational strains** and **extension strains**. Although this is applied to correction of the joint mechanics, the term “strain” used is defined as stress. This is a systematic procedure in which all of the corrections for either rotation or extension are performed in sequence. Extension strain corrections are used in the elderly or those with minor protrusions.
The sequence for **rotational strains** is as follows:

Rotational strain 1 – The patient is on their side, pain side down, upper thigh flexed 90 degrees. Twist the patient’s trunk during distraction. With one hand push the trochanter anteriorly, the other pushes the front of the shoulder down creating traction. Lean forward to increase rotation. Distraction is achieved as one hand pushes toward the patient’s head and the other toward their feet. After this position is held for a few seconds, jerk your own body forwards to increase rotation and distraction. If pain is felt in the lower limb, rotation is ceased and extension is replaced. If pain shoots down the leg, all manipulative procedures cease.

Rotational strain 2 - With the patient on their side, pain side down, contact their shoulder and hip as above. Move their shoulder anteriorly by contacting the scapula, pelvis is braced at the ASIS and moved posteriorly. Leans forward over the patient stretching the thorax and pelvis apart by pushing outwards. Rotation is gradually maximized. Jerk their body downward and force their arms further apart into rotation drawing the ilia towards them and thrusting the scapula down and away.
Rotational strain 3 – Contraindicated in patients with hip DJD or osteoporosis. With the patient supine, pain side up, grasped their thigh to bring it into extension while their shoulder is pushed toward the table. Your knee is abutted against their lower buttock to steady them. One hand bears down on the shoulder while the other hand fully extends and adducts the hip joint.

Rotational strain 4 – Contraindicated in patients with hip DJD or osteoporosis. With the patient supine, their knee and hip flexed, stabilize their shoulder against the table and rotate their spine toward them by contacting their knee. The spine is rotated by a downward push of the patient’s knee.
Rotational strain 5 – variation of rotational strain 4. The patient’s leg is stabilized against you and flexed over the opposing knee. Contact is on the opposite knee to accomplish rotation and side bending.

Extension strains are performed in the following sequence with the patient prone.

Forced extension strain 1 – The spinous of L4 or L5, is contacted by the pisiform. Thrust P-A and forward.
Forced extension strain 2 – Similar to forced extension strain 1 but the contact is more lateral and there is a rotary component. Thrust medial and downward.

Forced extension strain 3 – Perform only after improvement from the first 2 corrections. The patient’s ipsilateral thigh is grasped, adducted and extended. The other hand contacts just above the PSIS. The leg is further extended while the lumbar spine is pressed downward as you lean cephalid on the patient.
Forced extension strain 4 – Stronger version of forced extension 3 and is used with heavier patients. Use your their knee over the lumbar contact to increase downward lumbar pressure.

Forced extension strain 5 – Prone patient laterally bends their torso away from the side of pain. Contact their lumbar spine (superior hand is on their iliac crest, inferior hand pushes upwards under the ribs). Your hands are forced in opposing directions, thrust downwards increasing the distraction.
Lateral deviation of the lumbar spine - with the patient supine, both legs and hips flexed, knees crossed. If lateral antalgia is toward the right, the right thigh is on top. Contact both knees. The knee closer to you is pulled and the other is pushed away to achieve full lumbar side flexion. Repeat several times; then on the 4th or 5th time, hold for one minute. This correction is repeated until the patient’s standing antalgia has subsided.

**Ligaments:**

**Iliolumbar ligaments:**

Since these are larger ligaments, galvanic or interferential would be recommended along with ice and cold laser. Once swelling has subsided, ultrasound, mobilization or manipulation can be performed on affected segments. A brace can be used for stability but minimize use brace to avoid atrophy.

**Sacroiliac ligaments:**

These ligaments stabilize the sacral base within the pelvis preventing forward movement and nutation/counternutation. Injury can be painful and complicate spinal function.

Inflammation must be reduced, however, reaching the sacroiliac ligaments with physiotherapeutics can be difficult due to their deep location. Sine wave has been affective to reduce sacroiliac ligament inflammation because its alternating current provides slight movement during therapy to pump out inflammation. Ultrasound can only reach the very posterior ligaments. Ice will not penetrate deep into the joint. Sacral belts are recommended in severe acute cases as a belt could increase the pain from compression. During the inflammatory stage, for about 48 hours, sitting MUST be avoided.

**Inguinal ligament** injury can affect iliopsoas tendon, femoral artery and vein and viscera. Tears are most common at the pubic symphysis or ASIS but can occur anywhere along the ligament. Ice, microcurrent and ultrasound would best serve this ligament to decrease inflammation. Underlying iliopsoas injury must also be addressed.
*Interosseous ligament* between the pubic bones comprises a strong attachment. Ice for inflammation as the location prevents electrotherapy or ultrasound. Use low force techniques to realign the bones, discretion is advised.

Hour 11  
Section 51: Treatment of the Lumbopelvic Spine after Acceleration/Deceleration Impact  
(continued)

**Muscles:**

*Diaphragm, psoas, iliacus, quadratus lumborum, latissimus dorsi, back extensors, serratus posterior, semispinalis, multifidus, rotatores, interspinalis, intertransverse, rectus abdominus, external oblique, internal oblique, transversus abdominus* were previously covered in Sections 47 and 48: Treatment of the Thoracic Spine and Rib Cage after Acceleration/Deceleration Impact.

**Sartorius:**

51-1

*Strain/counterstrain - Tender point about 1 inch caudal of the ASIS is on the tendon. With the patient supine, their hip flexed, externally rotate and extend. Hold for 90 seconds.

51-2

*Trigger points in the sartorius are in the upper, middle and lower sections. Trigger point ultrasound is affective.
*Postfacilitation stretch is with the patient supine, their contralateral thigh and knee bent, their hand grasping their knee, the affected thigh and leg dropped off the table. If the angle of the knee is greater than 90 degrees, pressure against the affected ankle to increase knee flexion is done.

*Patella tracking should be evaluated prior to treatment to insure the strain will not continue if from a patella tracking problem. Once this is treated or ruled out, trigger point ultrasound is very affective in this muscle.
*Friction Massage - The patient is seated, their legs extended. Contact the tendon at the attachment to the ASIS. Direction of friction massage is medial to lateral and back on the patient.

For the biceps femoris, the patient can be seated or supine and their legs must be extended. Contact point is at the lateral side of the fibular head. Direction of friction massage is anterior to posterior and back.

Adductor group: adductor magnus, adductor brevis, adductor longus

*Postisometric relaxation - with the patient supine, their foot is approximated to their opposite knee with their hip in extension and adduction, knee resting on the table. Treatment is to bring their knee off the table for 20 seconds, then drop and relax. Repeat 3 times.

*Friction massage - The patient is supine, their hip abducted. Muscle belly is contacted 3-4 inches inferior to the attachment to the pubic bone. Direction of friction massage is medial to lateral on the muscle.

*Strain/counterstrain can be performed with the patient supine, their thigh crossed over the opposite thigh in adduction. Contact is near the attachment to the pubic bone.
*Trigger points are found anteriorly, medially and posteriorly. Trigger point ultrasound can be performed.

*Postfacilitation stretch is done with the patient on their side (involved side up), hips bent slightly, knees bent 90 degrees. Grasp their affected knee, extend the hips and abduct their thigh. The patient asserts counterpressure for 7 seconds. Repeat twice with increasing stretch each time.

*Stretch with the patient seated on the floor, their hip abducted and knee straight. The patient reaches for their foot with their hands.

**Gracilis:**

*Postisometric relaxation can be performed as described for the adductor group.

**Obturator externus:**

*Postisometric relaxation performed as for the adductors.
Strain/counterstrain - with the patient prone, flex their knee and grasp their ankle internally rotating their thigh so the ankle is touching the back of the opposite knee. Contact point is lateral to the coccyx.

Trigger point and continuous ultrasound can be performed but it is difficult to reach due to its depth within the pelvis. This muscle can be stretched with the gluteal muscles.

**Pectineus**

Postisometric relaxation as for the adductors.

Strain/counterstrain is performed supine. The tender point is deep within the groin but this technique is affective without contacting the tender point. Full flexion of the hip relieves pain from the pectineus.

Exercises include adduction with resistance, side lying leg lifts with bottom leg and adduction resistance with a flexible ring.

*Hamstring group: semimembranosis, semitendinosis, and biceps femoris.*

Friction massage for a spastic hamstring is either at the attachment to the ischial tuberosity or 2 inches below it. The direction of friction is lateral to medial and back.
*Postisometric relaxation is performed with the patient prone, their leg hanging over the edge of the table. The patient lifts their leg for 20 seconds, then drops it while relaxing for another 20 seconds. Repeat 3 times.

*Stretching:

A seated stretch for the hamstring is performed with the patient’s back against the wall. The patient takes a towel and wraps it around the bottom of their foot. With their back erect and against the wall, they lean forward as they pull on the towel.
*Postfacilitation stretch is performed with the patient supine, their leg lifted 80 degrees and rested on your shoulder. The patient pushes their leg against you for a count of 7. Further stretch the leg for a count of 12 seconds. Repeat twice.

*Trigger point ultrasound is best to use on these long muscles.

*Friction massage is the most effective method of treatment. The patient is on their side, friction pattern is medial to lateral and back on the ischial tuberosity attachment. When the patient stands after treatment, at least 50% of their pain should be alleviated. If this is ineffective, look toward the sartorius as the cause of pain.
*Trigger point ultrasound is affective.

*Strain/counterstrain is done with the patient prone. There are two tender points; one at the greater trochanter and one 5 inches below it. The position is adduction of the femur. If this is unsuccessful, look to the adductors for the cause of pain and treat the adductors using strain/counterstrain.

*Postisometric relaxation is done with the patient on their side, their affected side up, hips at the edge of the table, unaffected knee and hip flexed. They abduct their leg for a count of 20 then relax.
*Postfacilitation stretch is performed with the patient supine, their buttocks at the edge of the table, unaffected knee and hip flexed pushing against your hip. Their affected leg is hanging off the table. Contact their lateral knee and stabilize their pelvis. Press medially on the affected knee while the patient resists for 7 seconds. Adduct the thigh to stretch it for 12 seconds. Repeat twice.

*Stretch: With the patient standing, they cross their affected leg behind them and laterally bend away from the affected side, arm over head. Also, lateral bending on a Styrofoam roller at the pelvis can stretch the TFL of the convex side.

*Exercise: Side lying lateral leg lifts, hip at neutral.

Gluteus maximus:

*Trigger point ultrasound is very affective in all gluteal muscles. If the sartorius or TFL created instability, treat trigger points in the gluteus maximus that may have developed from compensation.
*Postisometric relaxation is done with the patient prone, their heels rotated outward. Cross your hands, one on each buttock. The patient contracts their buttocks, maintains this pressure for 10 seconds then release. Repeat twice.

*Stretches: supine. With the patient’s leg in a figure 4, they place their foot on the opposite knee. The opposite leg is brought up, the patient grasps the shin and pulls the opposite leg toward them.

*Exercises are leg press against resistance (either seated, prone or supine), squat or elliptical trainer.
Gluteus medius:

*Friction massage is performed on the lateral greater trochanter. Patient is prone, motion is anterior to posterior on the patient and back. This is also the site for trochanteric bursitis. Ice massage can be helpful in acute phases.

*Strain/counterstrain - patient is prone, hip extended and leg on your thigh which is on the table. Their leg is internally rotated and slightly abducted. Tender point is behind the TFL 2 inches from the ilia rim.

*Stretching is the same as for the gluteus maximus and tensor fascia lata.

*Exercise with squats, elliptical trainer and lateral leg lifts.
Gluteus minimus:

(Strain/counterstrain is performed supine, hip flexed, knee flexed, leg tucked under your arm. The femur is slightly abducted and internally rotated by pulling the foot more lateral than the knee. Tender point is 2 ½ inches inferior and lateral from the ASIS.

Exercise and stretching are the same as for gluteus medius.

Piriformis:

Spasm of the piriformis is common with sacroiliac joint dysfunction. Treatment of one may clear up the other.

Postfacilitation stretch - with the patient supine, hip flexed 60 degrees, knee flexed 120 degrees; contact their knee and internally rotate the hip by pulling their ankle laterally. The patient resists the outward pull of their ankle for 7 seconds, then releases for 12. Repeat twice increasing stretch.
*Postisometric relaxation - with the patient prone, their knee is flexed and hip is internally rotated. They lie on their side to allow the leg to be horizontal. They adduct their leg off the table and hold this position for 20 seconds. Repeat twice.

**Obturator internus (gamellus inferior and gamellus superior)**

*Strain/counterstrain is performed prone. Tender point is medial and behind the greater trochanter. The thigh is extended, hip internally rotated supported by the practitioner’s hand with their ankle pinned under their elbow.

**Bursa:**

Ischial bursa, trochanteric bursa, bursa of the gluteus medius and gluteus minimus and bursa of the vastus lateralis can all be treated with ice massage and friction massage. Contact points are near the greater trochanter.
Nerves:

Spinal cord, nerve root and nerve compression or elongation were previously covered in Section 43: Treatment of the Cervical Spine after Acceleration/Deceleration Impact.

Blood Vessels:

Treatment for injured blood vessels is out of the scope of this course. Identify the potential of dysfunction for appropriate referral.

Fascia:

Trigger point ultrasound is the most useful means of identifying and treating fascial damage. Massage, active release, mobilization and manipulation will stretch tissues and physically break up scar tissue and adhesions. Myofascial release is covered in Soft Tissue Injury 114, Deep Tissue Muscle and Fascial Release, Linda Simon, DC. Active Release is covered in Soft Tissue Injury 115, Active Myofascial Rehabilitation, Linda Simon, DC.

Section 52: Treatment of the Shoulder after Acceleration/Deceleration Impact

Bones:

Treatment for fracture is out of the scope of this course.
**Joints:**

**Glenohumeral osteoarthritis:**

This can be a complicating factor in acceleration/deceleration impact. Decreasing inflammation is the primary goal. Ice massage, EMS, cold laser are all effective. Mobilization in all ranges; lateral, anterior, posterior, posterior at 90 degrees, posterior inferior, posterior lateral, external rotation, and long axis extension brings necessary blood flow for mobility.

*Mobilization - supine. The procedures are as follows:

52-1

*Lateral movement* – The patient’s arm is against their body, elbow flexed 90 degrees and palm placed on umbilicus. Stabilize the elbow into the body, contact the patient’s axillary region and push the humeral head laterally.

52-2

*Anterior movement* – The patient’s arm is against their body, elbow slightly flexed and shoulder in some extension. Stabilize the patient’s elbow and grasp their arm to pull the humeral head anterior.
Posterior movement – The patient’s arm is against their body, elbow flexed, arm placed against their trunk. Stabilize their arm at the elbow while pushing their humerus posterior.

Posterior at 90 degrees – The patient’s elbow and shoulder are flexed to 90 degrees. Stabilize the posterior of the humerus while thrusting posteriorly on the anterior humeral head.
Posterior inferior - The patient’s elbow and shoulder is at 90 degrees, their arm across their face.
Grasp the humerus with both hands and depress the humeral head posteriorly.

Posterior lateral - With the patient in the same position as above, the thrust is posterior and lateral.

External rotation – The patient’s elbow is flexed at 90 degrees, their arm rotated externally.
Grasp their arm and further rotate the humerus externally.
Long axis extension – The patient places their arm on your lap as you grasp their arm and pull.

Glenohumeral Joint Instability:

Traumatic anterior instability is the most common. In acute stages, sling immobilization with the joint in internal rotation is necessary for up to 6 weeks.

*Ice.

*Interferential.

*Range of motion including Codman’s swing, flexion, abduction and external rotation.

*Isometrics of the rotator cuff muscles; teres major, pectoralis major, subscapularis and supraspinatus.

Traumatic posterior instability follows the same pattern of care. Strengthen the infraspinatus, teres minor, posterior deltoid, trapezius, latissimus dorsi and serratus anterior. Friction massage, trigger point ultrasound, active release and stretching are useful.

Glenoid Labrum Tears:

A tear in the labrum may indicate a tear in the fibrous capsule. Surgery may be required. MRI will assist in this diagnosis.

Glenohumeral dislocations:

Anterior and posterior shoulder dislocations should be reduced in an emergency setting.

Acromioclavicular Osteoarthritis:

This can be a complicating factor or secondary from by poor posture induced by curve alteration and muscle imbalance after a wreck. Decrease inflammation through rest, ice and microcurrent.
*Mobilize the acromioclavicular joint – supine. Grasp the distal third of the clavicle and move it anterior to posterior, then posterior to anterior.

*Manipulate the acromioclavicular joint – seated, their arm is against their trunk with elbow flexed. Stand behind the patient, contact their elbow and thrust toward the acromioclavicular joint.

*Stretch the coracobrachialis muscle to open the space between the acromion and clavicle. Have the patient place their arm over head with their hand on a door frame. They are to take a step(s) forward to begin stretch, then rotate their torso (not their neck) away from the affected arm and hold stretch for thirty seconds.

*Exercise the upper trapezius.

Acromioclavicular Joint Injury: The severity of injury is categorized into 6 types.

![Diagram of acromioclavicular joint]

**Type I** consists of an acromioclavicular ligament sprain.

*Rest, ice, immobilization with a sling for 1-3 days.

*Friction massage over the acromioclavicular ligament at the top of the shoulder across the joint line.
*Strain/Counterstrain – There are two positions.

Supine - contacts the medial tip of the clavicle, then draw the patient’s arm across their body toward their umbilicus.

Prone - contact the same point and pull the patient’s arm across the small of their back.

*Isometric strengthening of the trapezius, deltoids, flexors, abductors, internal and external rotators.

*Range of motion exercises in flexion, abduction and external rotation.

*Manipulation of the acromioclavicular joint.

**Type II** consists of acromioclavicular ligament disruption and coracoclavicular ligament sprain.

*Rest, ice, immobilization with a sling.

*Passive range of motion for flexion, abduction, external and internal rotation.

*Isometrics for flexion, extension, external and internal rotation.

*Stretching can begin when range of motion is improved for flexion, internal and external rotation.

*Strengthening can begin when range of motion is improved for internal and external rotation and scapula stabilizers.

**Type III** consists of disruptions in the acromioclavicular and coracoclavicular ligaments.

*Rest, ice, immobilization for 6 weeks.

*EMS for pain relief.
* Range of motion, isometrics, stretching and strengthening.

**Types IV – VI** are surgical conditions.

**Coracoacromial ligament sprain:**

*Ice and microcurrent.

*Friction massage across the ligament.

**Sternoclavicular Joint Injury:**

*Ice and microcurrent.

*Manipulation – With the patient seated, stand behind them and place their wrist under the axilla of the involved side stabilizing the clavicle with their hand. Your other hand is on the patient’s pectoralis with the thumb contacting the sternoclavicular joint. Thrust distally with the thumb laterally under the axilla. A non-force adjusting tool can also be used.

**Muscles:**

As mentioned for the cervical, thoracic and lumbopelvic muscles, acute injuries are best treated by ice, EMS, cold laser. For more chronic conditions, wet heat, EMS, massage and cold laser are all beneficial. Other muscle treatments for the upper and lower extremity will be listed according to the particular muscles discussed.

**Rotator Cuff:**

*Supraspinatus:

**Acute:**

*Stretching:

Passive – standing. Grasp the patient’s wrist and pull their arm across the small of their back, holding for 30 seconds.

Active – standing. The patient grasps their wrist behind their back and pulls their arm across the small of the back while laterally flexing their head opposite the affected side.
52-10
*Strain/Counterstrain – supine. The patient’s arm is abducted and flexed 45 degrees and placed on your shoulder. Contact the myotendinous junction of the supraspinatus and externally rotate the arm.

Chronic:

*Stretch as above.

*Strain/Counterstrain as above.

52-11
*Friction massage – seated. With arm neutral, the contact is at the insertion proximal to the greater tuberosity. The direction is A-P and back under the acromion.
*Post-isometric relaxation – seated. The patient’s arm is across their body. Stand behind them, grasp their arm and hold their shoulder. The patient takes a breath in and abducts against resistance. Repeat 3 times.

*Trigger point ultrasound – trigger points are in the muscle belly and radiate pain posterior-laterally down the arm but stop at the wrist.
*Active release – seated. The patient’s arm is raised over head, internally rotated. Contact the patient’s myotendinous junction (double thumb) and move the tissues across the muscle toward the patient’s neck as the patient brings their arm down and across their torso.

*Active stretch as above.

*Exercise:

Isometric: standing, arm neutral, elbow flexed, they press medially against a nonmoving object.

Isotonic: band work. Same position as above, they hold a band that is stabilized laterally, and internally rotate their arm against resistance. Light weight, the patient internally rotates and abducts their arm.
Infraspinatus:

Acute:

*Stretching – the patient interlocks their fingers in front of them, arms outreached, palms facing outward and pretends to push an imaginary wall.

*Strain/counterstrain – two tender points: supine

Upper point is one inch below the scapula spine and two inches from the medial muscle. With the patient’s elbow flexed, contact this point and raise the patient’s arm to 45 degrees abduction.

Lower point is two inches below the scapula spine and 1/2 inch from the medial border. With the patient’s arm next to their head, contact this point and move their arm overhead.

Chronic:

*Strain/counterstrain and stretch as above.

*Friction Massage – seated. The patient’s arm is on a table in 90 degrees flexion, arm externally rotated and elbow slightly flexed. Contact under the acromion at the lateral of the scapula spine. The motion is into the acromion and back.
*Post-isometric relaxation – supine. The patient’s arm is internally rotated and supported on the table, elbow flexed, forearm hanging off the table. The patient raises their forearm one inch and holds for 20 seconds, then relaxes into further internal rotation.

*Ultrasound – Trigger points are under the scapula spine medially and refer to the hand posterior-laterally or anteriorly. Another exists at the medial scapula border two inches below the spine and radiates toward the rhomboids.
*Active Release – prone. The patient’s elbow is flexed. Make a bilateral palm contact at the lateral of the muscle. While the patient reaches overhead, move the tissues medially and inferiorly.

*Active stretch as above.

*Exercise:

Isometric – standing, their elbow is bent, they contact a nonmoving object with the dorsum of their hand and contract.

Isotonic: Bandwork is performed with the patient in the above position, band stabilized medially and the patient externally rotates the arm.

Subscapularis:

Acute:

*Stretching:

Passive: Grasp the patient’s arm and pull it overhead medially.

Active: Arm over head and stretch.
*Strain/counterstrain – supine. The patient’s arm is dropped off the side of the table. Contact the antero-lateral of the scapula and internally rotate their arm.

**Chronic:**

*Active stretch and strain/counterstrain as above.

*Friction Massage - Contact the most tender aspect of the lesser tuberosity. Direction of friction is distal to caudal and back.
52-22
*Post-isometric relaxation – supine, their arm in abduction and external rotation, elbow bent, forearm off the table. They raise their hand for 20 seconds then releases.

52-23
*Ultrasound – trigger points are in the muscle belly and near the lesser trochanter. Pain radiation is to the posterior arm and shoulder, and dorsum of wrist. Trigger point ultrasound under the axilla can be performed but take caution to avoid the thorax.
*Active Release – supine, their arm in abduction and external rotation, elbow bent; contact the subscapularis under the axilla. While the patient extends the elbow, pull the tissues inferiorly.

*Exercise: Same as for supraspinatus.

Section 53: Treatment of the Shoulder after Acceleration/Deceleration Impact (continued)

Muscles (continued):

Rotator Cuff (continued):

Teres group (minor and major):

Acute:

*Stretching:

Passive - seated. Horizontally adduct the patient’s arm and internally rotate it.

Active - standing. The patient grasps their elbow to horizontally adduct arm and internally rotate.

*Strain/Counterstrain – supine, their arm abducted in the scapula plane 45 degrees, externally rotated, elbow bent. Contact the lateral scapula or posterior greater tuberosity. Hold the patient’s forearm during 90 second treatment.

Chronic:

*Strain/counterstrain as above.

*Friction Massage – Contact two inches below the scapula spine on the posterolateral of the glenohumeral joint. The movement is toward the spine of the scapula and back.
*Ultrasound – trigger points are near the lesser tuberosity. Patient’s arm must be in flexion for trigger points to be reached.

*Active Release and exercise – same as the infraspinatus covered in Section 52.

_Pectoralis minor_ and _pectoralis major_ were previously covered in Section 47. _Serratus Anterior, rhomboid group, trapezius, latissimus dorsi_ were previously covered in Section 48. _Levator scapulae_ was previously covered in Section 43.

Mobilization for scapula fixation between the scapula and the rib cage is very effective. With the patient prone, their dorsal forearm behind the small of their back, support the patient’s anterior shoulder with one hand and contact the inferior border of the scapula with the other (scapula angle in thenar notch). Rotate and lift the scapula freeing up the fixations underneath.

_Biceps:_

_Acute:_

*Stretching – seated on the floor, they place their arms behind them, palms to the ground and slide their torso forward.

*Strain/counterstrain: supine
Long head: Contact the bicipital groove, grasp the patient’s forearm, internally rotate and horizontally adduct their shoulder across their chest.

Short head: Contact the coracoid process, grasp the patient’s forearm, internally rotate and horizontally adduct their shoulder across their forehead.

**Chronic:**

*Stretch and strain/counterstrain as above.

*Friction massage – seated, elbow flexed, arm externally rotated. Massage the tendon laterally to medially.

*Post-isometric relaxation – seated, their elbow on their knee. The isometric phase is contraction of the forearm to 30 degrees.
*Ultrasound – trigger points are in the muscle belly near the elbow. Pain radiates to the anterior shoulder and antecubital fossa.

*Exercise:

Isometric - the patient applies force in elbow flexion to a stationary object with their forearm supinated.

Isotonic: seated. With light weights, their forearm is supinated 50 percent. As they flex their elbow, full supination is progressed until full flexion is achieved. The opposite action is performed as eccentric contraction.

_Coracobrachialis:_

This muscle can be injured during acceleration/deceleration from the seatbelt. Contraction rotates the superior aspect of the scapula anteriorly compressing the structures between the acromioclavicular joint and humeral head. It can cause impingement syndrome, worsen acromioclavicular osteoarthritis and cause shoulder, arm and cervical pain.

_Acute:_

*Ice at the coracoid process.

*Stretching:

Passive – seated. Contact their anterior shoulder and press it posteriorly.

Active – standing. The patient raises their arm overhead and places their hand on a door frame. They takes a step forward until maximum muscle length is reached, then turn their torso away from the affected side. The patient must not rotate their head.
*Strain/counterstrain – seated, their arm and elbow are flexed 45 degrees. Contact the coracoid process and internally rotate the patient’s arm for 90 seconds.

**Chronic:**

*Stretch and strain/counterstrain as above.

*Friction massage – With the patient’s arm in external rotation, contact the inferior border of the coracoid process and the direction is medial to lateral.

*Post-isometric relaxation – seated. Contact the anterior aspect of the patient’s shoulder and presses it posteriorly as they resist. Increased posterior range should be accomplished on each of the three attempts.

*Ultrasound – continuous or trigger point inferior to the coracoid process.

*Exercise – strengthening the upper trapezius will counteract the affect of a contracted coracobrachialis. This exercise should be combined with the above stretch.

**Anterior deltoid:**

**Acute:**

*Stretching – the patient grasps their hands behind their back, palms facing one another.

**Chronic:**

*Stretch as above.
*Friction massage – Contact the attachment at the lateral 1/3 of the clavicle. Direction is medial to lateral and back.

*Ultrasound – trigger points are located in the muscle belly and radiates to the lateral shoulder and arm.

*Exercise – standing, they abduct their arm halfway between the scapula plane and the sagittal plane, palm down. With light weights, they lift their arm straight up and down.

**Triceps:**

**Acute:**

*Stretching:

Active - seated. With the arm in sagittal abduction and internal rotation, elbow bent to reach top of shoulder, the patient uses their other hand to further abduct the arm.

**Chronic:**

*Stretch as above.

*Friction massage – treatment occurs at the distal triceps tendon at the olecranon process. Direction is medial to lateral and back.

*Post-isometric relaxation – seated, their arm is over the back of a chair in abduction and internal rotation, elbow flexed 90 degrees. The isometric phase is with their elbow flexed 70 degrees.

*EMS – biphasic or sine wave. Russian stimulation for atrophy.
*Ultrasound – trigger points exist in the muscle belly and radiates into the back of the shoulder and down the posterior arm to the dorsum of the hand.

*Exercise – the patient brings their arms overhead, elbows bent. Fingers clasp around a light weight and brings it to the upper thoracic spine.

**Posterior Deltoid:**

**Acute:**

*Stretching:

Active - grasp their arm at the elbow and move it across their body in horizontal adduction.

**Chronic:**

*Stretch as above.

*Post-isometric relaxation – with the patient standing, they abduct and internally rotate their arm for the isometric phase, then drop it to their side.

*EMS – biphasic or sine wave. Russian stimulation for atrophy.

*Ultrasound – trigger points are found in the muscle belly near the attachment to the humerus. Pain radiation is to the lateral shoulder.

*Exercise – With light weights, the patient’s elbows are flexed, arms internally rotated. The patient brings their arms into abduction.
Medial deltoid:

Acute:

*Stretching: standing, they grasp their arm behind the small of their back and pull toward the grasping hand.

Chronic:

*Stretch as above.

*Ultrasound – continuous or trigger point.

*Exercise – With light weights, the patient brings their arms into 90 degrees coronal abduction and back.

Bursa:

Subacromial bursitis:

An inflammatory process in the joint can lead to subacromial bursitis. It encompasses the area over and around the rotator cuff above the humeral head under the acromioclavicular arch. It also extends laterally between the rotator cuff and deltoid. Ice massage and EMS can be affective along with friction massage of the bursa once the inflammation has subsided.

Strain/counterstrain is also effective. With the patient supine, their arm in sagittal abduction, elbow bent, stabilize their wrist supporting their arm and contact the antero-lateral aspect of the humerus.

Subcoracoid bursitis:

Inflammation of this bursa is usually due to injury to the subscapularis tendon and/or long head of the biceps. This bursa can be found at the inferior tip of the coracoid process. Impingement syndrome is common with these injuries. Friction massage at the bursa and injured tendon and ligaments should be performed.
Nerves:

Suprascapular Nerve:

Injury can occur from arm direct blunt trauma to the superior aspect of the scapula. This nerve supplies the infraspinatus and supraspinatus. Initially, rest is vital and ice will decrease inflammation. Structural integrity can be restored with mobilization and manipulation. Assessing ligamentous and/or capsular damage that resulted from loss of integrity of the rotator cuff may require treatment.

Long Thoracic Nerve:
Injury usually occurs from overstretch between the head and shoulder or trauma to the rib cage. The serratus anterior will be directly affected and scapula winging may be evident. Winging takes about 10 days to appear. Rehabilitate the serratus anterior.

*Spinal Accessory Nerve:*

Injury occurs from excessive lateral hyperflexion. The trapezius becomes weak and shoulder drooping is evident. Rest, ice, rehabilitation of the trapezius as well as assessment of the scapula muscles must be performed.

*Axillary Nerve:*

Injury can be caused by fracture but also arm overhead overuse. Posterior deltoid and teres minor become weak. Rest, ice and rehabilitation deltoid and rotator cuff is warranted.

*Arteries:*

*Thoracic Outlet Syndrome* – previously covered in Section 43.
**Fascia:**

With acute conditions, ice and stretching are useful. Once inflammation subsides, wet heat, stretching, trigger point ultrasound, massage, myofascial release and cold laser have been effective in fascial release.

Section 54: Treatment of the Elbow, Wrist and Hand after Acceleration/Deceleration Impact

**Bones of the Elbow:**

Posterior Elbow Impingement Syndrome:

The olecranon process impinges the fossa. This occurs after hyperextension injury. Symptoms are pain, inflammation and limitation of extension. Ice and rest initially, strengthening of the elbow flexors and stretching of the elbow extensors are important. Taping to prevent full elbow extension is recommended.

**Bones of the Wrist:**

Impaction Syndrome:

Hyperextension of the wrist can allow the scaphoid to impinge on the radius leading to capsulitis, synovitis and/or fracture. If no fracture, strengthen the flexors and have the patient wear a wrist brace that limits extension. Ice, cold laser, galvanic bath will decrease swelling.

**Bones of the Hand:** Fracture is out of the scope of this course.

**Joints of the Elbow:**

In the elbow, osteoarthritis can be accompanied with tenosynovitis after trauma. Heat can assist joint degeneration but may inflame tendons and sheaths. Assess the extent of involvement of the associated soft tissues for appropriate treatment protocol. Joint play, fascial release, muscle stimulation, ultrasound and cold laser can be applied to associated tissues once inflammation has subsided.
Superior radial rotation can occur from forceful pronation/supination of the forearm. With the patient supine, elbow in full supination, stabilize their proximal radius. Contact their distal forearm and bring it into flexion and pronation. Feel the radial head against your thumb pressing against the metacarpal bone. Bring their forearm into pronation. This will be painful to the patient. With a quick thrust, pronate their forearm while maintaining the stabilization of their radial bone.

Radio-humeral joint can fixate from injury. Correction is as follows:

Standing, their elbow and wrist in flexion, forearm into pronation. Your thumb is on the radial head. Bring their arm into extension. At the point of pain, thrust the radial head into extension with your thumb.

*Joints of the Wrist:*

The joints around the scaphoid have been known to degenerate and become sclerotic. This can be a complicating factor. With DJD, flexion/extension are equally limited but the wrist may fixate in midposition. Treatment consists of joint play techniques to improve movement of the carpal bones. Friction massage is recommended for ligaments and tendons in the region. Wet heat preceding these procedures can help.

**Distal radioulnar joint:**

Fixation of this joint can limit forearm pronation. The ulna can be fixated on the radius in AP glide. Stabilize the patient’s wrist in neutral and use AP glide to mobilize the ulna. The rotation of the ulna can also be fixated. Treatment is done in the same position but rotate the ulna on its axis as you stabilize the radius.

**Radiocarpal joint:**

Radius articulates to the scaphoid and lunate. Fixation results in a loss of wrist flexion. There are two situations in which this can occur; long axis extension of the radiocarpal joint, and tilt of the scaphoid and lunate on the radius.

*Treatment for long axis extension is as follows:*
Standing, their elbow flexed to 90 degrees, forearm neutral, press into the antebrachium to stabilize the elbow. Grasp their wrist and pull the radius and ulna with a quick thrust.

*Treatment for tilt of the scaphoid and lunate is as follows:

Standing, their forearm in pronation; contact the end of the radius with the thumb (index finger stabilizes palmar surface of wrist) and follow its path to the end. This is the articulation with the scaphoid/lunate. While the wrist is stabilized at the ulnar region, a quick thrust with the thumb downward will reverse the scaphoid/lunate tilt.
Ulnomeniscotriquetral joint:

Region of the triangular fibrocartilage complex. Dysfunction will limit supination. Patient’s elbow flexed, wrist and hand neutral, contact the pisiform/triquetrum with the lateral of your index finger, and dorsal ulna with the thumb. Pincer movement approximates the ulna, triquetrum and pisiform.

Midcarpal joint:

Fixation of the midcarpal joint results in a loss of wrist extension in one of three ways:

*Long axis extension:

Patient’s elbow flexed 90 degrees, neutral forearm. Stabilize their elbow and contacts the distal radius and ulna. Pull the wrist with a counter motion to stabilize the elbow.

*AP glide:
Stabilize the proximal carpals. With index finger and thumb contact the palmar surface of the wrist over the distal row. Glide distal row toward the palmar surface. Allow to rebound.

*Backward tilt of the capitate on the scaphoid/lunate:

Patient’s elbow flexed, forearm and wrist neutral. Palpate the middle metacarpal bone to its base. Lateral to that is the capitate. Place the thenar eminence in this depression and press cephalid contacting the trapezium. The stabilizing hand contacts the base of the thenar eminence on the palmar surface. Squeeze two hands together causing the patient to extend their fingers.

Carpal subluxation:

Any carpal bone can fixate and tilt out of place with the most common being the capitate. Joint play can release fixations and identify which carpal bone is involved and which direction the corrections must occur. Capitate is corrected in a palmar direction with wrist traction. Friction massage (medial to lateral and back) of surrounding ligaments can assist with healing.
**Joints of the Hand:**

DJD has been previously discussed. RA is a severe complicating factor. If an RA patient injured their hand, depending upon severity it is best to work with their rheumatologist as treatments for RA are out of the scope of this course.

**Ligaments of the Elbow:**

**Ulnar collateral ligament injury:**

This primary valgus stabilizer is the most commonly injured elbow ligament. Inflammation and swelling will present at the medial epicondyle. MRI may be necessary to distinguish between partial and complete tears. Treatment consists of decreasing inflammation with ice massage and EMS. Once inflammation decreases, strain/counterstrain and friction massage can be done at the medial epicondyle. Stretching and strengthening of the pronator teres and flexor carpi radialis assists.

**Radial collateral ligament injury:**

Injury is usually secondary to elbow dislocation/subluxation, radial sprains or compression injuries from the radius against the humerus causing loose bodies. Ulnar collateral ligament injury will lead to an increase in vulnerability of radial collateral ligament injury. Reduce inflammation and use joint mobilization.

**Ligaments of the Wrist:**

The following conditions require immobilization for a period of 4-6 weeks. Ligaments will have the opportunity to heal but incomplete. Weakness and atrophy to musculotendinous structures will occur during immobilization. Once the cast is removed, proper rehabilitation using stretching, strengthening and Russian stimulation for atrophied tissues can be performed. Trigger point ultrasound may be effective for scar tissue and adhesions.

**Scapulo-lunate ligament instability:**

This includes injury to any one of three ligaments surrounding this joint; radioscapohamate, scaphoid-trapezium-trapezoid, and scapholunate interosseous.

**Luno-triquetral ligament instability:**

Pain on the dorsal surface with limited radial deviation.

**Midcarpal instability:**

This comprises several carpal intra-articulations. Instability occurs with injury to the dorsal triquetrum-hamate or palmar triquetrum-hamate-capitate ligaments. Pain with ulnar deviation or wrist pronation.
Triangular fibrocartilage complex instability:

Medial pain with ulnar deviation, compression and/or forearm supination.

Ligaments of the Hand:

For sprains, treatment must include associated fascial and tendinous components. Simple sprains without subluxation or dislocation are treated with ice and modalities to decrease inflammation, and range of motion and strengthening exercises to regain flexibility.

Ulnar collateral ligament injury:

The sprain of the ulnar collateral ligament of the thumb at the metacarpalphalangeal joint can be complicated due to the extent of injury. Grade I and II injuries entail ice immersion, splint with the thumb adducted and opposed for 4-6 weeks. Ranges of motion exercises include thumb opposition and flexion. Once successful, exercises include abduction and extension as well as a gradual return to activity. Grades III and IV are surgical conditions.

Muscles of the Elbow:

A hard grip of the steering wheel during acceleration/deceleration impact can injure the following forearm muscles.

Brachialis:

Acute:

*Stretch – same as biceps covered in Section 53.

*Continuous ultrasound.

Chronic:

*Stretch as above.

*Friction massage – Friction massage would be at attachment to the ulna inferior to its articulation with the humerus. Direction is medial to lateral and back.

*Continuous ultrasound or trigger point ultrasound. Trigger points are at the musculotendinous junction.

*Exercise – With light weight, the patient flexes their elbow from 90 to 145 degrees.
Supinator:

Acute:

*Stretch – passive forearm supination produces a better stretch.

*Continuous ultrasound.

Chronic:

*Stretch as above.

*Friction massage – with their forearm in pronation, elbow flexed, contact two inches inferior of the antebrachial fossa, direction is toward antebrachial crease and back.

*Post-isometric relaxation – with the patient seated, they brace their forearm against their trunk and pronate. Isometric phase is slight supination against slight resistance.
Continuous ultrasound may or may not reach the tissues. Trigger point ultrasound for the trigger point in the lateral antebrachium.

Exercise – resisted supination once pain is no longer a concern will exercise this muscle.

Section 55: Treatment of the Elbow, Wrist and Hand after Acceleration/Deceleration Impact (continued)

Muscles of the Elbow (continued):

Pronator Teres:

Acute:

*Stretch – passive forearm pronation with arm stabilization allows for stretch.

*Strain/counterstrain – supine, their elbow and wrist flexed to 90 degrees. Contact the medial epicondyle and rotate their forearm into full pronation.

*Continuous ultrasound

Chronic:

*Stretch and strain/counterstrain as above.
*Friction massage – seated, their forearm in supination on a table. Contact two inches below the attachment to the ulna/humerus. Direction is medial to lateral and back.

*Continuous ultrasound or trigger point ultrasound. Trigger points are found in the belly of the muscle or musculotendinous junction.

*Exercise – Isometric pronation against resistance.

Muscle/tendons of the Wrist:

Intersection syndrome: extensors

The tendon sheaths of the 1st and 2nd compartments cross over. Trauma causing inflammation can lead to tenosynovitis. Acute treatment consists of immobilization, ice, galvanic bath. Once inflammation subsides, wet heat, wrist flexion stretches, friction massage across the sheaths, cold laser and exercise wrist and index finger in extension.

De Quervain’s paratendonitis:

This affects the 1st tendon sheath. If injured, release the brachioradialis which adheres to the extensor retinaculum. For the acute phase, ice and galvanic bath are recommended. Once inflammation decreases, active release and friction massage distal to the radial styloid can be done. Exercise in wrist extension and stretching in wrist flexion are recommended.

Extensor carpi ulnaris tendinosis:

Injury to the distal ulna over the triquetral and near the attachment of the fifth metacarpal. This condition can be complicated by lateral epicondylitis. Once swelling has subsided, fascial release is the best course of treatment. This can be accomplished by friction massage, active release and myofascial release.

Extensor carpi radialis longus and brevis tendinosis:

Also complicated by lateral epicondylitis, swelling and inflammation must be decreased first. Then friction massage, active release and myofascial release is the course of treatment. Exercise and stretching will assist in rehabilitation.
Flexor carpi ulnaris tendinosis:

Ice, galvanic bath and immobilization until swelling is reduced is recommended. Once swelling subsides, friction massage proximal to the ulnar styloid, active release and myofascial release are recommended.

Flexor carpi radialis tendinosis:

This tendon sheath passes under the scaphoid and trapezium and is usually injured at the metacarpals. Immobilization in 10 degrees wrist flexion and slight radial deviation is recommended. Ice and galvanic bath decrease inflammation. Once inflammation is reduced, friction massage, active release and myofascial release will be affective.

Muscle/tendons of the Hand:

Extensor pollicis longus tendinosis:

RA and radius fracture must be ruled out prior to treatment. Thumb splint, rest, ice and galvanic bath will decrease inflammation. Once decreased, fascial release, active release, myofascial release, cold laser, EMS, stretching and strengthening will be beneficial; stretch of the thumb in flexion and strengthening with the thumb in extension.

Extensor indicis proprius syndrome:

Tendinosis of the fourth extensor compartment is treated with a splint, ice, galvanic bath; then once swelling subsides, fascial release, biphasic or bipolar interferential, cold laser. Stretching and strengthening must be part of the treatment protocol. This may take several months to resolve.

Extensor digiti minimi tendinosis:

Tendinosis of the fifth extensor compartment is treated with ice, splint, galvanic bath for swelling; and fascial release, stretching, strengthening, EMS and cold laser.

Flexor tenosynovitis:

Treatment for the flexor tendons is more difficult than extensor tendons due to their location within the palm. Ice, immobilization, galvanic bath will assist with swelling. If the condition is proximal to the flexor retinaculum, it will respond to friction massage, fascial release and active release. If the condition originates in the palm of the hand, manual methods will be less affective. Stretching, strengthening, continuous ultrasound and trigger point ultrasound as well as cold laser may have more affect in the palm.
**Fascia of the Elbow:**

The brachioradialis contributes to the forearm and wrist fascial components. Its association with the extensor retinaculum can lead to adhesions and scar tissue. Shearing forces on these structures can cause inflammation and tendinosis/tenosynovitis. Release fascial restrictions from both. If inflammation occurred, ice, immobilize and use galvanic bath. Soft tissue techniques most suited for fascial release are myofascial release, active release, friction and deep tissue massage, trigger point ultrasound, cold laser.

**Fascia of the Wrist:**

![Image of hand with hand being massaged]

Fascial release for the flexor digitorum superficialis is at the proximal aspect of the flexor retinaculum. Friction massage, active and myofascial release are all good techniques for the reduction of scar tissue and adhesions. Stretching is with the wrist and elbow in extension. Strengthen wrist flexors with light weight. Russian stimulation for atrophy of the thenar muscles if applicable.

Fascial release for the flexor retinaculum is as follows:

With the patient’s wrist over a table in extension, contact the retinaculum, compress and move the retinaculum from medial to lateral and back for 90 seconds.

**Guyon’s Ulnar Tunnel Syndrome:**

Swelling of the palmar carpal ligament, flexor carpi ulnaris aponeurosis, and flexor carpi ulnaris tendon in this tunnel compress the ulnar nerve and artery. Swelling causes paresthesias in the 4th and 5th fingers and weakness of the interossei, adductor pollicis, hypothenar and lumbricals. Fracture of the hamate can also cause this condition. Fracture is best referred to an orthopedist. Ligamentous, tendon sheath and aponeuroses conditions are treated with splinting, ice and galvanic bath. Friction massage, active release, myofascial release, ultrasound, trigger point ultrasound, stretching, strengthening and cold laser are used affectively. Russian stimulation treats atrophy of hypothenar components.
**Fascia of the Hand:**

The palmar aponeurosis is an extension of the palmaris longus muscle and gives rise to the thenar and hypothenar fascia, and palmar ligaments and covers the interosseous muscles. The aponeurosis divides within the palm into tunnels for long flexor tendons, lumbricals, blood vessel and nerves. The extensor retinaculum is not ligamentous but fascial in origin. With less fascia as a protective covering on the extensor side of the wrist, structures on the dorsal wrist are more vulnerable to injury.

**Extensor tendon synovitis:**

Treatment for the extensor tendons is less complex than for flexor tendons due to their accessibility. Ice, immobilization, galvanic bath will assist with swelling of fascial structures and tendon sheaths. If the condition is proximal to the extensor retinaculum, it will respond to friction massage, fascial release and active release, as well as stretching, strengthening, continuous ultrasound and trigger point ultrasound. If the condition is distal to the retinaculum, then modalities such as galvanic bath, stretching and strengthening will be preferred. Cold laser may have an effect.

**Bursa of the Elbow:**

The most clinically significant elbow bursa is the subolecranon. It can be treated with hourly warm soaks, an elbow splint and compression. Continuous ultrasound and cold laser can also be affective.
Nerves of the Elbow:

Radial nerve:

This can be compressed between the shoulder and elbow in nine places; subscapularis, axillary, fibrous arcade of the triceps, spiral groove of the humerus, proximal lateral elbow between the brachialis and brachioradialis, and at the radial tunnel over the radial head, extensor carpi radialis, supinator fibrous arch or distal lateral border. Fascial release can free this from entrapment. Compression in the radial tunnel requires rest, ice and immobilization. Friction massage, active release, and myofascial release can be done for the extensor carpi radialis and/or supinator. With no results by three months or the condition worsens, consider surgery.
Posterior interosseous nerve syndrome:

This can be compressed at the fibrous arcade affecting the extensor carpi ulnaris, extensor digitorum, extensor indicis, abductor pollicis longus and brevis and extensor pollicis longus. Treatment is as with radial nerve treatment protocol but if weakness persists or worsens, refer for surgery.

Ulnar nerve:
There are five locations for entrapment; subscapularis, arcade of Struthers (fascia covering the triceps and aponeurosis of the medial intermuscular septum), medial intermuscular septum, cubital tunnel and aponeurosis of the flexor carpi ulnaris. For conditions that do not recover spontaneously, two weeks of rest with their wrist and elbow in a splint can assist as well as fascial and active release.

Median nerve:

There are four locations for entrapment; subscapularis, infraclavicular, pronator syndrome, and anterior interosseous syndrome. Ice, rest and immobilize. Fascial release for subscapularis, pronator teres and tissues of the lateral epicondyle are effective. As in all entrapment conditions, surgery is an option if condition worsens or does not improve within 3 months.
Musculocutaneous nerve:

There are three locations for entrapment; pectoralis minor, coracobrachialis and fascia lateral to the biceps tendon. Treatment consists of rest, elbow splint to prevent extension, active and myofascial release. Surgery may be required.

Nerves of the Wrist: Entrapment can be treated with fascial release techniques as was previously discussed in this section under the heading Fascia of the Wrist.

Nerves of the Hand:

Distal posterior interosseous nerve syndrome:

Compression can occur over the distal radius entering the dorsal wrist. Treatment must not be initiated unless fracture and carpal instability have been ruled out. Once ruled out, treatment of ice, immobilization and galvanic bath; then fascial release, ultrasound and/or cold laser.
Hour 12
Section 56: Treatment of the Hip and Knee after Acceleration/Deceleration Impact

*Bones:*

*Relation of leg length to pelvic and hip distortion:*

Pelvic instability and rotated hip and knee can occur from leg length deficiency and would be a complicating factor after acceleration/deceleration impact. A functional longer limb could be due to spastic hip abductors, externally rotated hip, anteriorly rotated ilia. Manipulation of the ilia, hip mobilization in long axis extension, and fascial release are the best means of treatment.

The hip can be manipulated in flexion and adduction. With the patient supine, their hip flexed 90 degrees and knee in full flexion. Compress the knee into the hip downward and rock it into adduction. Release and repeat with the hip at 140 degrees.

Lateral distraction is performed with the patient supine. Contact their inner thigh, stabilize their leg and push the medial thigh laterally.

*Fracture:* Treatment of fractures is out of the scope of this course.

*Joints:*

*Osteoarthritis:*

As a complicating factor, with milder cases, weight loss and if necessary, hip abductor strengthening assists with healing. Flexibility of hip muscles, hip mobilization, fascial release and manipulation of the spine and sacroiliac joints will assist in hip function. Water aerobics can alleviate pain and increase function.

*Rheumatoid Arthritis and Gouty Arthritis:*

Treatment for these conditions are out of the scope of this course.

*Ligaments:*

*Sprains (iliofemoral, ischiofemoral, pubofemoral ligaments)*

Depending upon the location and degree of injury, sprains to the above ligaments can be treated conservatively. Rarely do the ligaments of the hip sprain however during acute trauma, it is possible to injure any soft tissue structure in the body. Inflammation must be reduced with ice, microcurrent, interferential current, galvanic or cold laser. Mobilization and/or manipulation can be useful as long as not contraindicated. Secondary effects such as muscle spasm and myofascitis should be addressed so as to avoid biomechanical dysfunction that would lead to chronic instability.
**Muscles:**

_Psoas_ has been previously covered in Section 47. _Iliacus_ has been previously covered in Section 48. _Sartorius, quadriceps femoris, tensor fascia lata, gluteus medius, gluteus minimus, pectineus, adductor longus, gracilis, gluteus maximus, hamstrings, piriformis, obturator externus and obturator internus_ have been previously covered in Section 51.

**Bursa:**

Trochanteric bursitis is common with low back and hip injury after acceleration/deceleration impact. Often associated with TFL and iliotibial band inflammation, ice massage and friction massage are best suited to treat this condition. Trigger point ultrasound can be used with more difficult cases.

**Nerves:**

**Entrapment syndromes:**

**Piriformis Syndrome:**

An inflamed piriformis can compress the sciatic nerve. Ice, fascial release, massage, ultrasound and Step Out Toe Out (SOTO) technique are all effective. For SOTO, the patient is prone, their hip abducted and externally rotated. Keep in this position for 30 seconds as a stretch.

**Lateral femoral cutaneous:**

Active release and myofascial release to the iliacus muscle and medial inguinal ligament near the ASIS into the medial thigh will assist in alleviating the condition. Ice and cold laser may allow for decrease in inflammation for the nerve.

**Superior cluneal nerve:**

This is found on the posterior iliac crest. With the patient on their side, pain side up, contact the region, find the taut tissue and push the fascia in the direction of most resistance. During this, the patient actively flexes their hip to further stretch the tissues.

**Iliohypogastric nerve, ilioinguinal nerve and genitofemoral nerve:**

These can become entrapped in the anterior pelvis and anterior thigh. Fascial release is the best means to release the tissues. With the patient supine, their hip and knee flexed, palpate deep into the iliacus and push the fascia toward the patient’s umbilicus as they extend their hip. Then ease off the contact, the patient then flexes their hip again as you contact the iliacus and push the fascia toward and down into the anterior thigh as they extend their thigh.
**Posterior cutaneous nerve:**

Fascial release may benefit in the posterior buttock inferior to the piriiformis. The best results are obtained with the patient on their side so they can flex their hip. This will stretch the tissues and allow for further release.

**Femoral nerve:**

This can become entrapped in the anterior pelvis and fascial release of the iliopsoas fascia may be beneficial.

**Fascia:**

Ice massage decreases inflammation and provides compression. Once inflammation subsides, use fascial tissue mobilization. Trigger point ultrasound is the most effective means of identifying and treating fascial damage. Massage, active release, mobilization and manipulation will stretch tissues and physically break up scar tissue and adhesions.

**Treatment of the Knee after Acceleration/Deceleration Impact**

**Bones:**

**Patella malalignment:**

This can occur when the knee hits the dash after acceleration/deceleration impact. Usually, the patella tracks laterally, therefore the lateral tissues need to be stretched and medial tissues need to be strengthened. Strengthening can be accomplished with knee extension exercises where the foot and leg are in lateral rotation. Fascial release on the lateral tissues is recommended as well as a non force manipulation of the patella medially. The patient can strap the patella against the quadriceps to stabilize it medially and with the leg beginning in flexion, slowly extend. This should be repeated at home.

**Chondromalacia patella:**

This can be a preexisting condition or caused by impact trauma. Spasms in the hamstrings, vastus lateralis and iliotibial tract should be evaluated and treated if present. Pronation should be assessed and corrected. Tibial malalignment should be addressed. Quadpolar interferential current may have an effect on the underlying inflammation associated with cartilage wear.

Strain/counterstrain can be performed for the patella. There are several possibilities of tender points on the patella. Once one is identified, the treatment is to put very slight pressure on the opposite side into the direction of the tender point.
Mobilization of the patella can be performed with the patient supine, their knee in 5 degrees of flexion. The patella can be contacted superiorly and stretched inferiorly, it can be contacted medially and pushed laterally, and it can be contacted laterally and pushed medially. The patella can be rocked A-P by first contacting the superior and inferior aspects and alternating slight compression to each.

**Joints:**

**Tibiofemoral joint:**

Torsion injuries can lead to inflammation and biomechanical dysfunction. Manipulation can be performed for varus tilt, valgus tilt, A-P glide, rotation and long axis extension.

Varus tilt is corrected with the patient supine, their knees flexed about 5 degrees. Contact their lateral ankle and medial thigh and thrust into the medial thigh laterally.
56-2
Valgus tilt is corrected with the patient in the same position as above. Contact their medial ankle and lateral thigh and thrust into their lateral thigh medially.

56-3
A-P glide is performed with the patient’s hip and knee in 45 degrees of flexion. Contact their superior tibia and thrust posteriorly.

56-4
Rotation of the tibial condyle of the femoral condyles occurs with the patient supine, their knee flexed 90 degrees rested on your knee. Stabilize the knee joint and grasp the ankle. This places the tibia into medial and lateral joint play.
Long axis extension is corrected with the patient supine, their leg abducted 45 degrees and off the side of the table. Grasp the patient’s foot and ankle between their legs and contact their inferior tibia with their hands. The action is to traction and thrust the foot and ankle as you extend your knees and superiorly push on the femur simultaneously.

Section 57: Treatment of the Hip and Knee after Acceleration/Deceleration Impact (continued)

*Joints* (continued):

*Tibiofibular joint:*

This joint can sprain and can be treated for A-P shear as follows:

With the patient supine, their knee flexed 90 degrees, contact the superior fibular head and move it A-P and P-A.
**Osteoarthritis:**

This complicating factor will limit of movement and inflammation needs to be addressed. Mobilization or low or non force manipulation of the knee joint can assist in pain control. Non weight bearing exercise such as water aerobics can increase range of motion. Ice, ultrasound and quadpolar interferential can all relieve pain. Spasms and weaknesses of muscles should be addressed. Orthotics may be required. Cold laser may be beneficial.

**Rheumatoid Arthritis and Gouty Arthritis:** Treatment for these conditions is out of the scope of this course.

**Capsular lesions:**

Local injury can be assessed for ligament damage and range of motion, decrease of inflammation and interferential current and cold laser may be beneficial

**Medial Plica Syndrome:**

This remnant of mesenchymal tissue is found in 60% of the population. If the plica becomes trapped in the patellarfemoral joint as the quadriceps contracts, pain at the inferior of the patella may lead to a giving away of the knee.

Friction massage at the medial plica (medial to the patella inferior to the medial retinaculum) will break down scar tissue. Stretching the hamstrings is also important. Full range quadriceps exercises are not recommended.
Ligaments:

*Meniscus lesion:* Most meniscus lesions are of the medial meniscus.

![Image](image1.jpg)

57-3

Strain/counterstrain can be performed with the patient supine, their leg hanging off the table just above the knee at 30 degrees flexion. The tibia is internally rotated with slight adduction so that the ankle can be just under the table. The tender point is at the edge of the medial inferior patella.

![Image](image2.jpg)

57-4

For the lateral meniscus, the tender point is over the lateral meniscus and the tibia can either be medially or laterally rotated and abducted or adducted. It depends upon what relieves the tender point with this specific condition.

Manipulation in the first 24 hours of injury has proven successful. The goal is to unlock the meniscus and relocate it. With the patient supine, their hip flexed to 90 degrees and knee flexed to 110 degrees, grasp their medial malleolus and externally rotate the foot as the knee is steadied with minor valgus stress.
Fully flex the knee pushing the heel into the buttock. If this is successful, then swelling should be treated and range of motion stretches should be introduced. If this was not successful, refer to an orthopedist.

Medial collateral ligament:

Friction massage is affective for grade 1 and 2 injuries. Decrease of inflammation using ice, compression, rest (crutches with partial weight bearing) and interferential current may be warranted. Quadriceps exercise, swimming, hip ranges of motion and eventually use of exercise bike will assist. A brace may be necessary depending upon the stability of the joint. Grade 3 and above should be referred to an orthopedist.

Lateral collateral ligament:

Treatment is similar to medial collateral ligament sprain.

Anterior cruciate ligament:

This ligament should not be treated conservatively if torn or immediately postoperative. With mild sprain, strengthen the hamstrings and quadriceps, avoid weight bearing, decrease inflammation, increase ranges of motion (initially use a brace to keep patient at 45 degrees of flexion) slowly over time. Walking, cycling and swimming are recommended.
Strain/counterstrain can be performed with the patient supine, knees slightly flexed and supported over a folded towel. Contact the superior tibia and compress it into the table. The tender point is in the center of the popliteal fossa on the hamstring tendon.

Posterior cruciate ligament:

Treat conservatively if only a mild sprain. Quadriceps should be strengthened and omit hamstring exercises. Bracing is necessary for athletes.

Strain/counterstrain can be performed with the patient supine as above. Contact the inferior femur and compress it into the table. The tender point is in the middle of the popliteal fossa.
Coronary ligament:

These bilateral ligaments can be treated conservatively if not torn. Mild sprains can respond to friction massage, ice, flexion and extension exercises and microcurrent. A brace may be required.

Muscles:

*Quadriceps femoris, hamstring group, gracilis* and *sartorius* have been previously reviewed in Section 51.

Popliteus:

Tenosynovitis, tendinosis, rupture or avulsion can occur from excessive pronation or excessive internal tibial rotation. A tear of the popliteal tendon can be misdiagnosed as a lateral meniscus tear which can be discerned by MRI. Friction massage, active and facial release to the popliteus, quadriceps, tensor fascia latae, gastrocnemius and biceps femoris assures that the region is well balanced and the tendon can heal. Mobilization of the knee and foot, ice, and postfacilitation stretch are recommended. Pronation, knee mechanics and gait should all be assessed.

Gastrocnemius/soleus/plantaris strain:

Rest, ice, compression and elevation can be accompanied by ultrasound and exercise. In the acute phase, the patient uses a towel and pulls up on their dorsiflexed foot for 10 seconds and releasing for 10 seconds for a period of 10 minutes. Friction massage can be performed across the belly.

Postfacilitation stretch can be performed for the gastrocnemius with the patient supine. The patient is asked to plantar flex against resistance for 7 seconds. Then they dorsiflex for 12 seconds as the practitioner tractions their calcaneus. This is repeated. The patient can put their knee at 30 degrees and the same treatment will affect the soleus.
**Bursa:**

*Prepatellar, infrapatellar, deep infrapatellar, popliteal, pes anserine:*

Bursitis is treated acutely with ice and in the knee, interferential current has shown to be very affective. Cold laser, rest and gentle range of motion exercises can be helpful. Friction massage has been shown affective for the pes anserine bursa.

**Nerves: Entrapment syndromes:**

*Peroneal nerve – deep and superficial:*

*Superficial* nerve entrapment can occur during inversion and plantar flexion. There may be a lateral ankle sprain or a weak peroneal muscle.

*Deep* nerve entrapment can occur with ankle sprains. It is usually entrapped in the distal foot causing weakness of the anterior compartment muscles. Treat with tibofibular joint mobilization, fascial release of the peroneal muscles. Proprioception exercises on a board can be helpful.

*Saphenous nerve:*

This can become trapped by the fascia of the vastus medialis, sartorius and adductor longus. Fascial techniques on the adductor muscle and surrounding tissues as well as ice and ultrasound are all helpful.

*Sural nerve:*

Travels between the two heads of the gastrocnemius and continues to the lateral malleolus. Entrapment can be caused from compression in the ankle fascia, behind the lateral malleolus, and at the 5th metatarsal after fracture. Fascial release is affective for this condition after fracture heals.

*Tibial neuropathy:*

The mid or distal thigh, popliteal region, calf or foot, all areas in which the tibial nerve can become trapped. Fascial constrictions or chronic tenosynovitis of the posterior tendons can constrict the nerve. Fascial release is the best course of treatment.

**Fascia:**

The inferior end of the iliotibial band can be treated. This can be important in the valgus alignment of the knee. Fascial release can reduce excessive valgus presentation by reducing the tension on the lateral structures. It can also free up a patella tracking issue if the lateral structures are interfering with function. Fascial release can be useful in treating the medial and posterior structures as well if examination determines involvement.
Section 58: Treatment of the Foot and Ankle after Acceleration/Deceleration Impact

**Bones:**

**Fractures:**

The bones of the foot can fracture during an acceleration/deceleration impact when the patient slams on the brake prior to or at the time of impact. Treatment for fractures is out of the scope of this course. Referral to an orthopedist that specializes in the foot and ankle is recommended.

**Joints:**

**Loose body:**

After an ankle sprain, a small piece of cartilage may become detached within the joint. Pain is brief and the displacement can be self-reduced. Symptoms are sudden erratic twinges on foot plantar flexion, most common when walking down stairs. If the patient cannot self-reduce this condition, the following manipulation can be performed with assistance.

![Supine, their heel level at the table’s edge, counter-traction is applied to the patient’s torso. Cup the patient’s heel allowing it to be a fulcrum. Grasp the dorsum of their foot, lean back pulling hard to distract the talus from the mortise joint. Strong circumduction is carried out several times while traction is maintained.](image)

**Capsular lesions:**

Most common is the talocalcaneal joint, second most common is the midtarsal joint. DJD usually follows a fracture involving the articular surface of the calcaneus. Varus becomes limited and eventually results in complete fixation. Galvanic bath, cold laser, mobilization, manipulation and custom orthotics may assist with the pain.
Metatarsophalangeal joint injury (turf toe):

Hyperextension sprain of the big toe can be treated with ice, compression and elevation for 20 minutes 4-6 times per day. Taping for immobilization and a turf toe steel shank can be put into the shoe. EMS, ROM for active flexion and extension are done. Once inflammation is decreased, ultrasound and strengthening exercises such as tubing for toe flexion can assist healing.

Manipulation of the ankle and foot:

Mortise joint:

This important stabilizing joint is formed by the distal malleoli of the tibial and fibula into which the talus articulates. Pain is upon dorsiflexion and walking uphill or up stairs.

Long axis extension:

Supine with the knee and hip flexed 90 degrees, foot everted. Sit with your back to the patient, hands cupping their ankle. Contact the dorsum of the foot at the talus and posterior ankle above the Achilles tendon. The motion is to push the thumbs toward the plantar foot with slight counter pressure against the patient’s upper leg.
Antero-posterior glide on the talus:

Supine, their knee and ankle is flexed to 90 degrees. Contact above the mortise joint and stabilize the plantar surface of the foot. The movement is A-P glide push/pull.

Subtalar joint:

Long axis extension:

Supine patient; contact the dorsal navicular with the thumb web and the other thumb web contacts the calcaneus just above the Achilles tendon insertion. Action is distraction without eversion.
Subtalar rock:

With the patient and practitioner as above, the movement is distraction. The thumb web contacting the calcaneus pushes with slight wrist flexion as the other thumb web pushes in the opposite direction to rock the calcaneus.

Medial and lateral tilt:

With the patient and practitioner as above, use long axis extension then thrust the foot toward the floor without twisting to open the joint medially. Lateral tilt is done in the opposite direction.

Midfoot:

AP glide of the metatarsal on the cuneiforms:

Supine, their knee flexed 90 degrees. Stand laterally, find the base of the 1st metatarsal and place your superior hand over the cuneiform, inferior hand over the 1st metatarsal. The inferior hand
moves so that the index fingers and knuckles of both hands approximate one another for AP glide.

**AP glide of the cuneiforms on the navicular:**

With the patient as above, move your hand one inch proximally from the position above so that the superior hand is on the navicular and inferior hand is one the cuneiform. The action is as above.

**AP glide of the navicular on the talus:**

Supine patient; your superior hand is moved one finger width proximally and onto the calcaneus laterally and talus medially. The inferior hand is on the navicular and cuboid. Action is as above.

![Image of foot and leg](58-7)

**Dorsal raise:**

Supine patient, ankle dorsiflexed; grasp the patient’s talus as thumbs brace the plantar surface. Thrust toward the plantar surface and toes.

![Image of foot and leg](58-8)
Metatarsal-tarsal mobilization:

Supine patient, stabilize the dorsal cuneiforms and cuboid with index finger and thumb web. Index finger of the other hand makes contact with the metatarsal. The metatarsal heads are lifted and a clockwise then counterclockwise movement is used.

![Image of Metatarsal-tarsal mobilization](image)

Intermetatarsal mobilization:

Supine patient; sit at the foot of the patient and contact the shaft of the 4th and 5th metatarsals. Index finger is on the dorsal aspect and thumb on the plantar aspect of the forefoot just proximal to the metatarsals. The movement for the 5th metatarsal is AP while stabilizing the 4th metatarsal. A rotational mobilization is then performed in a clockwise then counterclockwise direction. The 3rd metatarsal is stabilized while the 4th metatarsal is mobilized. The 2nd metatarsal is stabilized as the 3rd and 1st metatarsals are mobilized.
Metatarsophalangeal joint:

Long axis extension:

Supine patient; contact their phalanx with the index finger at the plantar surface and thumb holding the phalanx. The movement is to stabilize the metatarsal with the opposite thumb and pull the phalanx.

Medial and lateral tilt:

Patient and practitioner are as above. Movement is medial then lateral.

AP glide:

Patient and practitioner as above, the movement is tilted in the plantar direction then to the dorsum.

Rotation:

Patient as above, contact the phalanx with the index and middle fingers on the dorsum and their plantar surface with the thumb. While the metatarsal is stabilized a rotational force is applied clockwise then counterclockwise.
Cuboid:

AP glide is performed with the patient supine. Contact the dorsal and plantar surfaces of the cuboid with index finger and thumb. The other hand contacts the dorsum of the 5th metatarsal shaft. The action is plantar to dorsal then back in a rotational wringing movement.

Strain/counterstrain can be performed for the joints of the feet.

Extension ankle:

Tender point is on the medial head of the gastrocnemius. Patient is prone, their knee flexed and foot braced with traction to the thigh of the practitioner whose foot is on the table level with the patient’s knee.
**Flexion ankle:**

Tender point is at the ankle dorsum medial to the extensor tendon. Patient prone, their knee flexed and ankle dorsiflexed, exert force under the ball of the foot and slightly rotate to the position of most comfort.

**Talus:**

Tender point is on the medial dorsum of the foot two centimeters distal to the medial malleolus. Treatment is with inversion and internal rotation of the foot. Slight flexion and/or extension may be necessary for position of most comfort. There may also be a tender point on the medial gastrocnemius.
Medial ankle:

Tender point is in a small arc below the medial malleolus. Treatment is inversion of the foot with little internal rotation.

Lateral ankle:

Tender point is 3 centimeters distal to the lateral malleolus. Patient is on the affected side with knee bent and foot over the edge of the table, towel rolled up under their ankle. With the heel of your hand, up to 40 pounds of force is applied 3 centimeters below the medial malleolus causing eversion and mild external rotation of the foot. There may be an alternate tender point on the top of the fibula.
Plantar navicular:

There is a tender point beneath the navicular near the cuboid. The patient is prone, their knee bent 90 degrees, foot inverted toward your abdomen. Wrap index finger around the navicular. Reinforce index finger with the 3rd finger and with the thumb of the other hand for power.

High navicular:

Tender point is with flexed metatarsals on the medial bone. Place your foot on the table and press your knee against the lateral of the patient’s foot. The foot is bent over the knee by pulling the front and heel to laterally bend it.
Plantar cuboid:

Tender point is on the cuboid tuberosity ¾ of an inch back and medially from the 5th metatarsal base. Prone patient with knee flexed 45 degrees and ankle dorsiflexed. Eversion is accomplished by pressure on plantar surface of 5th metatarsal base.

Extended cuboid:

Tender point is one centimeter distal from that of the lateral ankle. Dorsiflexion of the lateral half of the foot is required. Prone patient, knee bent 90 degrees and foot braced against the practitioner’s abdomen.
Calcaneus:

Flexed calcaneus:
Commonly found with plantar fascitis. Tender point is near anterior calcaneus in the medial plantar surface of the foot. Prone patient, their foot on your thigh (their foot on the table); heel is pushed toward the front of the foot as it is plantar flexed.

Later al calcaneus:
Commonly associated with heel spurs, tender point is one inch inferior and posterior to lateral malleolus. Treatment is a torsion stretch with the heel rolled outward and the front of the foot rotated into eversion.
Medial calcaneus:

Treat as opposite of lateral calcaneus.

Section 59: Treatment of the Foot and Ankle after Acceleration/Deceleration Impact (continued)

Ligaments:

Depending upon the degree of injury and location of ligament, sprain can be treated conservatively as long as the ligament is mostly intact. For grade 1 sprains, inflammation must be reduced. This can be accomplished with ice, microcurrent, interferential current, galvanic or cold laser. Mobilization and/or manipulation techniques can be very useful as long as not contraindicated. Taping and/or bracing should be considered for stabilization and support. However, functionality should be considered and taping should not affect the proper function of the muscles around the joint to avoid atrophy. Secondary effects such as muscle spasm and myofascitis should also be addressed if present. Grade 2 ligament injuries can be treated conservatively if there is little tearing. Grade 3 and above ligament injuries cannot be treated conservatively and the patient should be referred for surgical repair.

Ankle ligaments:

Medial collateral ligaments:

Valgus sprains are rarer than varus sprains and will injure the medial ligaments. The lateral ligaments are more frequently injured in combination; anterior talofibular, calcaneocuboid ligament, calcaneofibular ligament.

A treatment protocol discussed by Warren Hammer, DC divides the process into three phases of injury; phase I is acute, phase II is rehabilitation, phase III is return to normal function.
Phase I:

Grades I and II: Ice
  Active ranges of motion including ankle pumps, ankle circles and ankle alphabet
  Passive ranges of motion including towel stretch for dorsiflexion held for 10-15 seconds
  for 5 reps
  Strengthening exercises 3X per day including isometrics of plantar flexion, dorsiflexion,
  eversion and inversion. Towel toe curls.

Grade III: Ice
  Active range of motion including dorsiflexion and eversion. Do not begin until
  tenderness over the ligament subsides.
  Brace and walking boot
  Gait training

Phase II (for all grades):
  Ice
  Heel cord stretching held for 30 seconds, 5 reps
  Joint mobilization/manipulation
  Tubing for inversion, eversion, dorsiflexion; 3 sets of 10 twice per day.
  Toe raises (3 sets of 10)
  Balance board for Proprioception

Phase III: Gradual return to sports activity. Taping or bracing is recommended during activity.

*Friction massage can be performed for the anterior talofibular ligament, the calcaneofibular
ligament, calcaneocuboid ligament and the anterior tibiofibular ligament as follows:

Foot ligaments:

Calcaneocuboid ligament in the midtarsal joint is the most frequently injured ligament in the
foot. This occurs with a varus or inversion injury and is usually torn near the lateral aspect of the
joint. The talofibular ligament is usually sprained at the same time. Ligaments of the subtalar
joint, midtarsal joint, tarsometatarsal joints, intermetatarsal joints, metatarsophalangeal joints and
interphalangeal joints can also be injured but are less common occurrences.

Muscles:

Ankle:

Dorsiflexors or flexors:

Extensor hallucis longus, tibialis anterior, extensor digitorum longus and peroneus tertius will
be covered under Anterior Compartment Syndrome in this section.
Plantar flexors or extensors:

*Gastrocnemius, soleus, plantaris* have been previously covered in Section 57.

*Peroneus brevis* and *longus*:

*Rest, ice, compression and elevation can be accompanied by ultrasound and exercise.

[*Friction massage - there are two regions that can be treated; one by the tendon at the lateral malleolus, the other just above that where the tendon begins. Perform in a pronation/supination direction with the foot in inversion and dorsiflexion.*](image)

*Trigger point ultrasound can be done in the peroneal muscles as follows:*

*Tibialis posterior*:

*Rest, ice, compression and elevation can be accompanied by ultrasound and exercise.*
*Friction massage can be performed with the muscle stretched in eversion and dorsiflexion. The direction of massage is pronation/supination.

*Flexor digitorum longus and flexor hallucis longus:

*Rest, ice, compression and elevation can be accompanied by ultrasound and exercise.

*Friction massage can be performed for the posterior compartment muscles including the flexor digitorum longus, flexor hallucis longus and the tibialis posterior as follows:

**Mid-range of the foot:**

*Lumbricals:*

*Continuous ultrasound, ice bath and galvanic foot bath can assist with strained muscles.

**Plantar surface of the foot:**

*Dorsal interossei, plantar interossei, flexor digiti minimi brevis, abductor digiti minimi, flexor hallucis brevis, abductor hallucis, adductor hallucis.*

*Continuous ultrasound, trigger point ultrasound, ice bath and galvanic foot bath can assist with strained muscles.*
Rupture of plantaris tendon:

Sudden dorsiflexion of the ankle may rupture the plantaris tendon. Treatment would require surgery and is out of the scope of this course.

Anterior compartment syndrome:

Tibialis anterior, extensor hallucis longus and extensor digitorum longus travel the anterior compartment. Swelling can result in necrosis of the muscles, nerves and blood vessels which can lead to foot drop.

*Ice massage, EMS, ultrasound, continuous or trigger point. Trigger points are as follows:

![Image of leg with trigger point marked]

59-5

*Friction massage can be performed where the muscle meets the tendon on the anterior shin about 4-5 inches proximal to the ankle.

*Postisometric relaxation is performed with the patient seated or supine. Place the hand over the patient’s toes to bring both the foot and toes into plantar flexion and supination. The patient resists for 10 seconds, then relaxes. Repeat 3 times.

*Exercise the anterior muscles.

Ruptured Achilles tendon:

An abrupt strain can rupture this tendon most likely 3cm proximal to its insertion into the calcaneus. Excessive dorsiflexion is evident. Plantar flexion of the foot is impossible. Gait would be altered where there may be an absence of push off from the stance phase and flat footedness. Treatment for complete rupture is surgical and out of the scope of this course. Achilles tendinosis is treatable conservatively.
Decrease inflammation with ice. Increase flexibility of the gastrocnemius by having the patient lean into a wall with the involved foot slightly rotated inward, heel down and knee straight placed behind the uninvolved foot. Hold for 30 seconds. Repeat in 5 sets three times per day. A heel lift can be used to decrease stress on the Achilles tendon for the first week. Friction massage can be performed on the tendon near the attachment to the calcaneus. Orthotics may be used to decrease the stress on the Achilles tendon.

Tarsal tunnel syndrome:

Tarsal tunnel is behind the medial malleolus covered by the flexor retinaculum including the tendons of the posterior tibialis, flexor digitorum longus and flexor hallucis longus as well as the tibial artery, nerve and vein. Motor symptoms, burning pain and paresthesias can be present and can be aggravated by prolonged walking or standing. Symptoms should be differentiated with intervertebral disc syndrome, plantar fascitis, diabetic neuropathy, ganglion, hindfoot valgus, lipoma and various veins. Gait can become altered and lead to plantar fascitis. Fascial release is a successful method of releasing the entrapments. This can be accomplished by trigger point ultrasound, manual massage and friction massage at the muscles mentioned above. Orthotics may also be beneficial.

Bursitis:

Calcaneal and retrocalcaneal bursa can become inflamed due to damage to the Achilles tendon or excessive pressure on the region. Ice, microcurrent or cold laser may be beneficial in bringing down the inflammation.

Nerves:

Nerve entrapment can be treated by fascial release methods. Treatment for nerve tear is out of the scope of this course. However, symptoms need to be recognized for referral.

Foot drop:

Injury to the common peroneal nerve may result in paralysis of the dorsiflexor and evertor muscles.

Tear of tibial nerve:

Paralysis of the leg flexor muscles, loss of sensation and use of intrinsic foot muscles, and the ability to plantar flex the foot or toes is characteristic of injury to this nerve.

Metatarsalgia:

Fibrous swelling of the 4th digital nerve is due to entrapment between the heads of the 4th and 5th metatarsal bones. Stretch calf muscles, strengthen weak flexor muscles.
Morton’s Neuroma:

Nerve entrapment between the metatarsals can lead the fascia to develop a neuroma. This can be caused by slamming on the brakes. Swelling of the nerve presents with scarring and constriction creating shooting pains.

Fascia:

Plantar fascitis:

* Ice massage perpendicular to the plantar fibers.
* Ultrasound.
* Friction massage.
* Orthotics can be helpful with a built in depression for the attachment to the calcaneus.
* Stretching for the gastrocnemius held for 30 seconds repeated 5 times per day.
* Toe curls.
* Orthotics for chronic conditions.

Synovitis:

The lining of tibialis posterior, flexor digitorum longus and flexor hallucis longus tendons can become inflamed causing pain behind the medial malleolus with tenderness to palpation. Ice massage assists in decreasing inflammation. Stretches for the tibialis posterior, and flexor group will ease the stress against the bone. Trigger point/ ultrasound may reduce scar tissue. Orthotics may help if there is an underlying foot imbalance.

Section 60: Late Effects of Acceleration/Deceleration Impact

Acceleration/Deceleration impact can be all encompassing. Any trauma will cause mental, physical and emotional stress to your patient. The severity depends upon extent of trauma and the mental and emotional state of the patient at the time of impact. Individuals who are under stress at the time of impact will notably experience more severe overwhelm from their injuries. Each patient has different pain thresholds, and each patient has their own particular capability of dealing with stressful situations. A complete history will help you to understand the patient’s mental and emotional state and alterations that have occurred to their normal lives. This is important for any physician treating acceleration/deceleration impact because due to the nature of the situation, the role of patient advocate is inevitable.
Some patients choose to retain attorneys. This will be helpful as they will assist the patient and relieve some of the role you, as their advocate, should play. If you do not know the attorney the patient has chosen to use, it is advisable to introduce yourself immediately and assure their attorney that you have their client’s best interest at hand and offer information regarding your professionalism in these matters. If the attorney is not assured, they may convince the patient to seek care elsewhere. This could possibly put the patient in a situation where their needs are not best met because the judgment call came from a non health professional no matter how well meaning they may seem.

Communication with the patient is vital to assure them that they are in the best care in your office. Whether they are a new patient or an existing one, they still need reassuring at this time as overwhelm may cause them to doubt what was previously reliable. You will be treating this patient for their traumatic injuries for anywhere from 3 months to years. Periodic reevaluations and communication will help assure them that they are progressing and that it may take a long time to regain their lifestyle and be free of pain. Referral to appropriate physicians for conditions out of practice scope who will communicate with your office also offers as a confidence builder for your patient.

Some patients will never be free of pain or dysfunction after their traumatic incident. Encouraging them to continue their healing process and allowing them to accommodate their physical condition at the time is a delicate balance. Optimism in times of crisis will allow for extraordinary results. Safety for the present is advised and appreciated. This may be in the form of braces, collars, canes, walkers, crutches, slings, etc.

High quality soft tissue injury treatment will assist in preventing long term conditions such as fibromyalgia, traumatically induced osteoarthritis, chronic headaches, biomechanical dysfunction from healed injured tissues such as fractures, fascial torque, ligament and muscular microtearing. Restoring joint and muscle function can help prevent DJD. Craniopathy, TMJ treatment, cervical function restored will help prevent headaches from becoming lifelong afflictions. Restoring normal function to extremities will prevent further nerve compression from adhesions and prevent spinal distortion from aberrant movement of the upper and lower extremities.

The ability to recognize the development of fibromyalgia after a traumatic incident is one of the most important responsibilities as a practitioner. This lifelong debilitating illness can be caused by trauma and can set in within 3 months of injury. Ask your patient about their sleep throughout the first couple of months of care. If they are not getting proper sleep, you must assist them in achieving this goal. The window of opportunity is small, so they need to act quickly. Loss of sleep is a major trigger and symptom of FMS. Any supplement containing tryptophan, melatonin, valerian root, or a combination of these substances will aid sleep. Be wary of drugs such as Ambien, Lunesta as these drugs can cause sleep walking and exacerbate depression. If the patient must be on sleep medication, there are alternatives that have been proven safe and have been on the market for years and they should discuss them with their medical physician.

Other indicators of fibromyalgia include irritable bowel, chest pain (non-cardiac), hypothyroidism, hypersensitivities (eyes, ears, skin), flu-like symptoms, fatigue. If any of these symptoms appear after the trauma, this is a good indication that your patient is on their way to
developing this condition. Begin testing for the tender points prior to the three month official onset date. They may be evident. Scleratomal pain and myofascial trigger point radiation pain may be present in the region as well. You can treat those as well as using strain/counterstrain points to affect the pain levels. Anything that breaks the pain in a region will go far to cue the brain that there is less pain to deal with. Strain/counterstrain is a highly effective tool to achieve this goal. Arnica as a topical or oral treatment for pain can take the edge off. Cold gels such as Biofreeze can also benefit. Treat with food rotation allergy diet, and good nutritional supplementation. Place the patient on prophylactic magnesium/malic acid supplements. Test for systemic yeast infection which could have flourished after an immune fatigue from traumatic injuries. Perhaps put patient on brief disability so they can normalize their sleep. I do not usually recommend disability for mental and emotional reasons but preventing FMS seems a justifiable cause. Treat the patient as if they have the condition prior to the three month official onset date and their condition may be prevented.

Depression can be triggered or worsened from a traumatic event. Many patients are under a misunderstanding of this condition and often do not communicate their anxiety or that their emotional threshold has somehow been altered. Explain to each acceleration/deceleration impact patient at the onset of care that this is a possibility and if they experience anxiousness, bad dreams, fear behind the wheel or in the vehicle itself, outbursts such as anger or tears, that they should report this to you immediately. Referral to a psychologist you know in these cases can successfully treat the patient’s condition and help them to understand the necessity of optimism in healing.

Family members who were not in the vehicle, upon patient approval, should be informed of the patient’s condition. They should be a part of the consultation, history, and some of the patient’s treatments so they understand and can support the patient in this time of crisis. A supportive parent, child, spouse or friend can go a long way in the patient’s mind set and readiness to set goals and heal. The family can also help you understand what their loved one was like before the injury and give you a better idea of the goals they can achieve.

Sometimes, patients who have experienced acceleration/deceleration impact discover the benefits of soft tissue treatment and manipulation and realize that through good nutrition, sound ergonomic advice, directed exercise, their complicating factors they had prior to the impact will benefit during treatment. This is a positive consequence but one in which needs to be balanced with the legal responsibilities of getting the patient back to their pre-accident condition. The benefits of soft tissue treatment and the long term improvements the patients will receive may improve your patient’s life dramatically. Those that choose to adapt proper diet, exercise and continued spinal and soft tissue evaluation and treatment may be grateful and in the end may feel that their horrible traumatic experience brought them to a better place.

Treating injuries from acceleration/deceleration impact can be minimal to all encompassing depending upon their extent of injury, complicating factors and mental and emotional state. Being a prepared and thorough practitioner will be of great benefit in your patient’s life. I strongly recommend reading the text book material referenced below in the “References” section. Soft Tissue treatment is highly beneficial but needs to be a commitment on the part of the
practitioner and patient for ultimate success. The benefits can be extraordinary, long term and for you, the practitioner, highly rewarding.

Thank you for taking this course.

Linda Simon, DC

References:

Moore, Keith L. *Clinically Oriented Anatomy*. Williams and Wilkins (1980).

Illustrations:
Illustrations and photographs by Linda Simon, DC.