Anatomy of the Spine









Α Dens Atlas Cervical curve Axis в Thoracic curve С Lumbar curve





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Functional Anatomy of the Spine

- Movements of the spine include flexion, extension, right and left lateral flexion and right and left lateral rotation
 - Minimal movement w/in the thoracic region
- Movement of the spine and muscle contributions
- Superficial and deep musculature functioning and abdominal muscular functioning
 - Flexion and extension
 - Trunk rotation and lateral flexion

Prevention of Injuries to the Spine

- Cervical Spine
 - Muscle Strengthening
 - Muscles of the neck resist hyperflexion, hyperextension and rotational forces
 - Prior to impact the athlete should brace by "bulling" the neck (isometric contraction of neck and shoulder muscles)
 - Varied of exercises can be used to strengthen the neck
 - Range of Motion
 - Must have full ROM to prevent injury
 - Can be improved through stretching

– Using Correct Technique

- Athletes should be taught and use correct technique to reduce the likelihood of cervical spine injuries
- Avoid using head as a weapon, diving into shallow water
- Lumbar Spine
 - Avoid Stress
 - Avoid unnecessary stresses and strains of daily living
 - Avoid postures and positions that can cause injury
 - Correction of Biomechanical Abnormalities
 - ATC should establish corrective programs based on athlete's anomalies
 - Basic conditioning should emphasize trunk flexibility
 - Spinal extensor and abdominal musculature strength should be stressed in order to maintain proper alignment

– Using Correct Lifting Techniques

- Weight lifters can minimize injury of the lumbar spine by using proper technique
- Incorporation of appropriate breathing techniques can also help to stabilize the spine
- Weight belts can also be useful in providing added stabilization
- Use of spotters when lifting
- Core Stabilization
 - Core stabilization, dynamic abdominal bracing and maintaining neutral position can be used to increase lumbopelvic-hip stability
 - Increased stability helps the athlete maintain the spine and pelvis in a comfortable and acceptable mechanical position (prevents microtrauma)

Assessment of the Spine

• History

– Mechanism of injury (rule out spinal cord injury

- What happened? Did you hit someone or did someone hit you? Did you lose consciousness
- Pain in your neck? Numbness, tingling, burning?
- Can you move your ankles and toes?
- Do you have equal strength in both hands
- Positive responses to any of these questions will necessitate extreme caution when the athlete is moved

– Other general questions

- Where is the pain and what kind of pain are you experiencing?
- What were you doing when the pain started?
- Did the pain begin immediately and how long have you had it?
- Positions or movements that increase/decrease pain?
- Past history of back pain
- Sleep position and patterns, seated positions and postures

• Observations

- Body type
- Postural alignments and asymmetries should be observed from all views
- Assess height differences between anatomical landmarks





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Postural Malalignments



• Cervical Spine Evaluation

- Assess position of head and neck
 - Symmetry of shoulders (levels)
 - Will the athlete move the head and neck freely?
 - Assess active, passive and resisted ROM
- Thoracic Spine Evaluation
 - Pain in upper back and scapular region
 - Cervical disk or trigger points (long thoracic nerve or suprascapular nerve involvement)
 - Lower thoracic region pain
 - Facet joint involvement
 - W/ deep inspiration and chin tucked to chest

- Lumbar Spine and Sacroiliac Joint Observations
 - Coordinated movement of the low back involves the pelvis, lumbar spine and sacrum
 - Equal levels (shoulders and hip)
 - Symmetrical soft tissue structures bilaterally
 - Observe athlete seated, standing, supine, sidelying, and prone (leg position - contractures)

- Palpation
 - Spinous processes
 - Spaces between processes ligamentous or disk related tissue
 - Transverse processes
 - Sacrum and sacroiliac joint
 - Abdominal musculature and spinal musculature
 - Assessing for referred pain
 - Have athlete perform partial sit-up to determine tone and symmetry
 - Assess hip musculature and bony landmarks as well

- Special Tests Cervical Spine
 - Brachial Plexus Test
 - Application of pressure to head, neck and shoulders to re-create MOI
 - Lateral flexion of the neck w/ same side pain indicates a compression injury
 - Lateral flexion of the neck w/ opposite side pain indicates stretch or traction injury
 - Cervical Compression and Spurling's Test
 - Compression of cervical spine compresses facets and spinal roots
 - Level of pain determines specific nerve root impingement
 - Spurling's adds a rotational component to the cervical compression

- Vertebral Artery Test
 - Athlete is supine
 - ATC extends, laterally bends, and rotates the c-spine in the same direction
 - Dizziness or nystagmus indicates occlusion of the vertebral artery
 - Refer to a physician for testing



- Shoulder Abduction Test
 - Athlete places hand on top of head
 - A decrease in
 symptoms may
 indicate the presence of
 nerve root
 compression, due
 possibly to a herniated
 disk



- Test Done in Standing Position
 - Forward bending
 - Observe movement of PSIS, test posterior spinal ligaments
 - Backward bending
 - Anterior ligaments of the spine
 - Disk problem
 - Side bending
 - Lumbar lesion or sacroiliac dysfunction
 - Standing Trunk Rotation
 - Assessment of symmetrical motions w/out pelvic movement

- Test Done in Sitting Position
 - Forward bending PSIS motions and restrictions
 - Rotation lumbar spine motion symmetry
 - Hip Rotation IR and ER to assess integrity and status of the piriformis muscle
 - "Sign of the Butt" used to assess potentially serious hip pathology
 - Pain w/ passive ROM, straight leg raise, and hip flexion w/ knee flexion
 - Capsular pattern= limitation of flexion, abduction, internal rotation w/ slight limitations in hip extension and no limitation of external rotation
 - Non-capsular pattern of limitation gross limitation in all ranges
 - External rotation limitation is the key motion lost in this test

• Slump Test

- Monitor changes in pain as sequential changes in posture occur
- 1. Cervical spine flexion
- 2. Knee extension
- 3. Ankle dorsiflexion
- 4. Neck flexion released
- 5. Both legs extended
- Assessment of neural tension



- Tests Done in Supine Position
 - Straight Leg Raise
 - 0-30 degrees = hip problem or nerve inflammation
 - 30-60 degrees= sciatic nerve involvement
 - W/ ankle dorsiflexion = nerve root
 - 70-90 degrees = sacroiliac joint pathology
 - Kernig's test
 - Unilateral straight leg raise (lumbar pain into buttocks)
 - Impingement of nerve root due to disk, bony entrapment or irritation of meninges
 - Brudzinkski's test
 - Modified Kernig's w/ neck flexion
 - Lumbar disk or nerve root irritation

– Well Straight Leg Raising Test

• Performed on the unaffected side, may produce pain in the low back on the affected side and cause radiating pain in the sciatic nerve





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- Milgram and Hoover Straight Leg Raising Test
 - Milgram test involves a bilateral straight leg raise that increases intrathecal pressure placing pressure on the disk and nerve roots
 - The Hoover test is a variation that utilizes a unilateral straight leg raise









– Bowstring test

- Used to determine sciatic nerve involvement
- Leg (on affected side) is lifted until pain is felt
- Knee is flexed to relieve pressure and popliteal fossa is palpated to elicit pain (along sciatic nerve)
- To verify problem w/ nerve root, leg is lowered, ankle is dorsiflexed and neck is flexed.
 - Return of pain verifies nerve root pathology
- FABER and FADIR tests
 - FABER or Patrick's test is used to assess hip or SI joint dysfunction
 - FADIR is used to assess problems of the lumbar spine

– Knee to Chest

- Bilateral increases symptoms to lumbar spine
- Single pain in posterolateral thigh may indicate problem with sacrotuberous ligament
- Pulling knee to opposite shoulder that produces pain in the PSIS region may indicate sacroiliac ligament irritation
- SI Compression and Distraction Tests
 - Used for pathologies involving SI joint





- Pelvic Tilt Test
 - Anterior and posterior tilts that increase the pain on the side being stressed indicate irritation of the SI joint
 - Can also be performed from side-lying



- Tests Done in Prone Position
 - Press-ups
 - While prone, push up trunk while hips remain fixed to extend the spine
 - Herniated disk would be apparent with radiating pain
 - Localized pain = conservative treatment
 - Generalized pain = surgery may be necessary



– Reverse Straight Leg Raise

- If pain occurs in low back, an L4 nerve root irritation may be present
- Spring Test
 - Downward pressure is applied through the spinous processes of each vertebrae to assess anterior/posterior motion
 - Can also be performed on transverse processes to assess rotational movement
 - Useful to determine hypomobility or hypermobility of specific vertebral segments

Prone Knee Flexion Test

- Comparison of apparent leg lengths w/ athlete prone long-lying and w/ knees flexed to 90 degrees
- If there is a short side it is indicative of a posteriorly rotated SI joint
- If upon flexing the knees the lengths equalize, the posteriorly rotated SI joint is indicated




- Tests Done in Side-lying
 - Femoral Nerve Traction Test
 - Hip is extended and knee is flexed to 90 degrees
 - As the hip is extended pain occurs in the anterior thigh = nerve root impingement in the lumbar area
 - Posterior Rotational Stress Test
 - Pain on movement near PSIS indicates irritation of the SI joint
 - Localizes pain to a specific point does not indicate direction of dysfunction
 - Piriformis Muscle Stretch Test
 - Flexing both hips to 90 degrees and lifting the top leg places the piriformis in a stretched position
 - Increasing pain indicates myofascial pain in that muscle

- Iliotibial Band Stretch Test
 - Test will often
 provoke pain in
 the contralateral
 PSIS area
 indicating and SI
 problem
 - SI dysfunction can lead to a shortening of the IT-Band and a perpetuation or reoccurrence of the problem



- Quadratus
 Lumborum
 Stretch
 - Use of the pillow
 opens the upper
 quadratus to
 palpation
 - Dropping the leg off the table will provide some stretch to the muscle and possibly provoking pain or demonstrating tightness



- Neurological Exam
 - Sensation Testing
 - If there is nerve root compression, sensation can be disrupted



– Reflex Testing

- Three reflexes in the upper extremity include the biceps, brachioradialis and triceps reflexes
 - Tests C5, C6, and C7 nerve roots respectively
- The two reflexes to be tested in the lower extremity are the patellar tendon and Achilles tendon reflexes

- Used to assess the L4 and S1 nerve root respectively

Recognition and Management of Specific Injuries and Conditions



Cervical Spine Conditions

 Mechanisms of Injury



- Cervical Fractures
 - Etiology
 - Generally an axial load w/ some degree of cervical flexion
 - Signs and Symptoms
 - Neck point tenderness, restricted motion, cervical muscle spasm, cervical pain, pain in the chest and extremities, numbress in the trunk and or limbs, weakness in the trunk and/or limbs, loss of bladder and bowel control
 - Management
 - Treat like an unconscious athlete until otherwise rule out use extreme care

- Cervical Dislocation
 - Etiology
 - Usually the result of violent flexion and rotation of the head
 - Signs and Symptoms
 - Considerable pain, numbness, weakness, or paralysis
 - Unilateral dislocation causes the head to be tilted toward the dislocated side with extreme muscle tightness on the elongated side
 - Management
 - Extreme care must be used more likely to cause spinal cord injury than a fracture

- Acute Strains of the Neck and Upper Back
 - Etiology
 - Sudden turn of the head, forced flexion, extension or rotation
 - Generally involves upper traps, scalenes, splenius capitis and cervicis
 - Signs and Symptoms
 - Localized pain and point tenderness, restricted motion, reluctance to move the neck in any direction
 - Management
 - RICE and application of a cervical collar
 - Follow-up care will involve ROM exercises, isometrics which progress to a full isotonic strengthening program, cryotherapy and superficial thermotherapy, analgesic medications

- Cervical Sprain (Whiplash)
 - Etiology
 - Generally the same mechanism as a strain, just move violent
 - Involves a snapping of the head and neck compromising the anterior or posterior longitudinal ligament, the interspinous ligament and the supraspinous ligament
 - Signs and Symptoms
 - Similar signs and symptoms to a strain however, they last longer
 - Tenderness over the transverse and spinous processes
 - Pain will usually arise the day after the trauma (result of muscle spasm)
 - Management
 - Rule out fracture, dislocation, disk injury or cord injury RICE for first 48-72 hours, possibly bed rest if severe enough, analgesics and NSAID's, mechanical traction

- Acute Torticollis (Wryneck)
 - Etiology
 - Pain on one side of the neck upon wakening
 - Result of synovial capsule impingement w/in a facet
 - Signs and Symptoms
 - Palpable point tenderness and muscle spasm, restricted ROM, muscle guarding,
 - Management
 - Variety of techniques including traction, superficial heat and cold treatments, NSAID's
 - Use of a soft collar can be helpful as well

• Cervical Cord and Nerve Root Injuries

- Etiology

- Mechanisms include, lacerations, hemorrhage (hematomyelia), contusion and shock
- Can occur separately or together
- Signs and Symptoms
 - Various degrees of paralysis impacting motor and sensory function; the level of injury determines the extent of functional deficits
 - Cord lesions at or above C3 result in death, while injury below C4 will allow for some return of nerve root function
 - Incomplete lesions can result in a number of different syndromes and conditions
- Management
 - Handle w/ extreme caution to minimize further spinal cord damage

- Cervical Spine Stenosis
 - Etiology
 - Syndrome characterized by a narrowing of the spinal canal in the cervical region that impinges on the spinal cord
 - Result of congenital condition or changes in vertebrae (bone spurs, osteophytes or disk bulges
 - Signs and Symptoms
 - Transient quadriplegia may occur from axial loading, hyperflexion/extension
 - Neck pain may be absent initially
 - Sensory and motor deficits occur but generally recover slowly w/in 10-15 minutes
 - Management
 - Extreme caution must be used; Diagnostic testing (X-ray, MRI) must be used to determine extent of problem
 - Participation in sports is generally discouraged

• Brachial Plexus Neurapraxia (Burner)

- Etiology

- Result of stretching or compression of the brachial plexus disrupts peripheral nerve function w/out degenerative changes
- Signs and Symptoms
 - Burning sensation, numbress and tingling as well as pain extending from the shoulder into the hand
 - Some loss of function of the arm and hand for several minutes
 - Symptoms rarely persist for several days
 - Repeated injury can result in neuritis, muscular atrophy, and permanent damage
- Management
 - Return to activity once S&S have returned to normal
 - Strengthening and stretching program
 - Padding to limit neck ROM during impact

- Cervical Disk Injuries
 - Etiology
 - Herniation that develops from an extruded posterolateral disk fragment or from degeneration of the disk
 - MOI involves sustained repetitive cervical loading
 - Signs and Symptoms
 - Neck pain w/ some restricted ROM
 - Radicular pain in the upper extremity and associated motor weakness
 - Management
 - Rest and immobilization of the neck to decrease discomfort
 - Neck mobilization and traction to help reduce symptoms and regain motion
 - If conservative treatment is unsuccessful or neurological deficits increase surgery may be needed

Thoracic Spine Conditions



• Scheuermann's Disease (Dorsolumbar Kyphosis)

- Etiology

- Result of wedge fractures of 5 degrees or greater in 3 or more consecutive vertebrae w/ disk space abnormalities and irregular epiphyseal endplates
- Can develop into more serious conditions
- Signs and Symptoms
 - Kyphosis of the thoracic spine and lumbar lordosis w/out back pain
 - Progresses to point tenderness of the spinous processes; young athlete may complain of backache at the end of a very physically active day
 - Hamstring muscles are characteristically tight

- Management

- Prevent progressive kyphosis work on extension exercises and postural education
- Bracing, rest, and NSAID's may be helpful
- Stay active but avoid aggravating movements

Lumbar Spine Conditions

Low Back Pain

- Etiology
 - Congenital anomalies
 - Mechanical defects of the spine (posture, obesity and body mechanics)
 - Back trauma
 - Recurrent and chronic low back pain
- Signs and Symptoms
 - Pain, possible weakness, antalgic gait, propensity to ligamentous sprain, muscle strains and bony defects
 - Neurological signs and symptoms if it becomes disk related
- Management
 - Correct alignments and body mechanics
 - Strengthening and stretching to ensure proper segmental mechanics

- Lumbar Vertebrae Fracture and Dislocation
 - Etiology
 - Compression fractures or fracture of the spinous or transverse processes
 - Compression fractures are usually the result of trunk hyperflexion or falling from a height
 - Fractures of the processes are generally the result of a direct blow
 - Dislocations tend to be rare
 - Signs and Symptoms
 - Compression fractures will require X-rays for detection
 - Point tenderness over the affected area
 - Palpable defects over the spinous and transverse processes
 - Localized swelling and guarding



- Management
 - X-ray and physician referral
 - Transport with extreme caution and care to minimize movement of the segments

- Low Back Muscle Strain
 - Etiology
 - Sudden extension contraction overload generally in conjunction w/ some type of rotation
 - Chronic strain associated with posture and mechanics
 - Signs and Symptoms
 - Pain may be diffuse or localized; pain w/ active extension and passive flexion
 - No radiating pain distal to the buttocks; no neurological involvement
 - Management
 - RICE to decrease spasm; followed by a graduated stretching and strengthening program
 - Complete bed rest may be necessary if it is severe enough
 - NSAID's

• Myofascial Pain Syndrome

- Etiology
 - Regional pain with referred pain to a specific area that occurs with pressure or palpation of a tender spot or trigger point w/in a muscle
- Signs and Symptoms
 - Piriformis pain in posterior sacroiliac region, into buttocks and down posterior portion of thigh; deep ache that increases w/ exercise or prolonged sitting w/ hip adduction, flexion and medial rotation

- Quadratus lumborum sharp aching pain in low back, referred to upper buttocks and posterior sacroiliac region and abdominal wall; increased pain with standing, coughing, sneezing and sit to stand motions; pain increases with side bend toward the trigger point
- Management
 - Stretching and strengthening of the involved muscle
 - Return muscle to normal length
 - Electric stimulation and ultrasound can be used to treat discomfort and pain

- Lumbar Strains
 - Etiology
 - Forward bending and twisting can cause injury
 - Chronic or repetitive in nature
 - Signs and Symptoms
 - Localized pain lateral to the spinous process
 - Pain becomes sharper w/ certain movements or postures
 - Passive anteroposterior or rotational movements will increase pain
 - Management
 - RICE, joint mobs, strengthening for abdominals, stretching in all directions
 - Trunk stabilization exercises
 - Braces should be worn early to provide support

- Back Contusions
 - Etiology
 - Significant impact or direct blow to the back
 - Signs and Symptoms
 - Pain, swelling, muscle spasm and point tenderness
 - Management
 - RICE for the first 72 hours
 - Ice massage combined with gradual stretching
 - Recovery generally last 2 days to 2 weeks
 - Ultrasound is effective for deep muscle treatment

• Sciatica

– Etiology

- Inflammatory condition of the sciatic nerve
- Nerve root compression from intervertebral disk protrusion, structural irregularities w/in the intervertebral foramina or tightness of the piriformis muscle
- Signs and Symptoms
 - Arises abruptly or gradually; produces sharp shooting pain, tingling and numbness
 - Sensitive to palpation while straight leg raises intensify the pain
- Management
 - Rest is essential acutely
 - Treat the cause of inflammation; traction if disk protrusion is suspected; NSAID's

- Herniated Disk
 - Etiology
 - Caused by abnormal stresses and degeneration due to use (forward bending and twisting)



Signs and Symptoms

- Centrally located pain that radiate unilaterally in dermatomal pattern
- Symptoms are worse in the morning
- Onset is sudden or gradual, pain may increase after the athlete sits and then tries to resume activity
- Forward bending and sitting increase pain, while back extension reduces pain
- Straight leg raise to 30 degrees is painful
- Decreased muscle strength and tendon reflexes; Valsalva maneuver increases pain

– Management

- Initial treatment should involve pain-reducing modalities (ice and stim)
- Manual traction and extension exercises to reduce protrusion of disk
- As pain and posture return to normal additional strengthening exercises can be added
- If disk is extruded or sequestrated pain modulation is key
- Flexion exercise and lying supine in a flexed position may help with comfort
- Surgery may be required

- Spondylolysis and Spondylolisthesis
 - Etiology
 - Spondylolysis refers to degeneration of the vertebrae due to congenital weakness (stress fracture results)
 - Slipping of one vertebrae above or below another is referred to as spondylolisthesis and is often associated with a spondylolysis
 - Signs and Symptoms
 - Spondylolysis begins unilaterally
 - Pain and persistent aching, low back stiffness with increased pain after activity
 - Frequent need to change position
 - Full ROM w/ some hesitation in regards to flexion
 - Localized tenderness and some possible segmental hypermobility
 - Step off deformity may be present









– Management

- Bracing and occasionally bed rest for 1-3 days will help to reduce pain
- Major focus should be on exercises directed as controlling or stabilizing hypermobile segments
- Progressive trunk strengthening, dynamic core strengthening, concentration on abdominal work
- Braces can also be helpful during high level activities
- Increased susceptibility to lumbar strains and sprains and thus vigorous activity may need to be limited

Sacroiliac Joint Dysfunction

- Sacroiliac Sprain
 - Etiology
 - Result of twisting with both feet on the ground, stumbles forward, falls backward, steps too far down, heavy landings on one leg, bends forward with knees locked during lifting
 - Causes irritation and stretching of sacrotuberous or sacrospinous ligaments and possible anterior or posterior rotation of innominate bones
 - With pelvic rotation hypomobility is the norm, however, during the healing process hypermobility may result and allow the joint to sublux
Signs and Symptoms

- Palpable pain and tenderness over the joint, medial to the PSIS w/ some muscle guarding
- Pelvic asymmetries, measurable leg length deformities, blocked normal movement during trunk flexion
- Pain after 45 degrees during the straight leg raise and increased pain during side bending when moving toward the painful side
- Pain may radiate posteriorly, laterally, or anteriorly down the thigh and may even be vaguely located in the groin
- Increased pain w/ unilateral stance
- Movement from sit to stand will create pain
- Sitting is usually comfortable



- Management
 - Modalities can be used to reduce pain
 - Bracing can be helpful in acute sprains
 - SI joint must be mobilized to correct positioning
 - Strengthening
 exercises should be
 used to stabilize the
 joints

- Coccyx Injuries
 - Etiology
 - Generally the result of a direct impact which may be caused by forcibly sitting down, falling, or being kicked by an opponent
 - Signs and Symptoms
 - Pain is often prolonged and at times chronic
 - May even cause irritation to the coccygeal plexus
 - Management
 - X-rays and rectal exam may be required to determine the extent of the injury
 - Analgesics and a ring seat to relieve pressure while sitting
 - Pain from a fractured coccyx could last months
 - May require protective padding to prevent further injury

Rehabilitation Techniques for the Neck

Joint Mobilizations

• Can be extensively used in rehabilitating the neck for pain reduction, increasing ROM and restoring mobility









Flexibility Exercises

- Must restore the neck's normal range of motion
- All mobility exercises should be performed pain free
- Perform exercises passively and actively (flexion, extension, lateral bending and rotation)
- Exercises should be performed 2-3 times daily, 8-10 reps and held for at least 6 seconds for each stretch

Strengthening Exercises

- Should be initiated when near normal range has been achieved, and should be performed pain free
- Exercises should progress from isometric to isotonic exercises



Rehabilitation Techniques for the Low Back

- There are a number of philosophical approaches to low back rehab
- Initial treatment should focus on modulating pain (ice, stim, rest; avoid aggravating motions or positions
- Analgesics for pain modulation or muscle relaxants to decrease muscle guarding
- Progressive relaxation techniques

General Body Conditioning

- With acute low back pain, the athlete can be limited for some time
- Activity must be modified during the initial stages
- Resume activity as pain can be tolerated
- Aquatic exercise may be useful to maintain fitness levels

Joint Mobilizations

- Can be used to improve joint mobility or to decrease joint pain by restoring joint accessory motion
- Gradual progression from grade 1 and 2 joint mobs to grades 3 and 4 as pain and muscle guarding subsides
- Should be engaged in, in conjunction w/ manual traction

Traction

- Treatment of choice when there is a small protrusion of the nucleus pulposus
- Distraction of vertebral bodies creates subatmospheric pressure that pulls protrusion back to normal position
- Can be used daily for 2 weeks
- Amount of traction used is a percentage of the patient's body weight

Flexibility

• There are a variety of exercises that can be performed









Strengthening Exercises

- Should be routinely incorporated into the rehab program
- Used to reinforce pain-reducing movements and postures
- Extension exercises
 - Should be used when pain decreasing w/ lying down and increases w/ sitting
 - Backwards bending is limited but decreases pain -- forward bending increases pain
 - STLR is painful

- Flexion Exercise
 - Used to strengthen abdominals, stretch, extensors and take pressure off nerve roots
 - Pain increases with lying down and decreases with sitting
 - Forward bending decreases pain
 - Lordotic curve does not reverse itself in forward bending
- PNF Exercises
 - Chopping and lifting patterns can be used to strengthen the trunk, re-establish neuromuscular control and proprioception

Neuromuscular Control

- Must re-educate muscles to contract appropriately
- Stabilization exercises can help minimize the cumulative effects of repetitive microtrauma
- Core/dynamic stabilization
 - Control of the pelvis in neutral position
 - Integration full body movements and lumbar control
 - Incorporation of abdominal muscle control is key to lumbar stabilization

Functional Progressions

- Progression of stabilization exercises should move from supine activities, to prone activities, to kneeling and eventually to weight-bearing activities
- Stabilization exercises must be the foundation and should be incorporated into each drill

Return to Activity

- Acute sprains and strains of the back take the same amount of time to heal as most extremity injuries
- With chronic or recurrent injuries, return to full activity can be frustrating and time consuming
- Extensive amounts of time and education concerning skills and techniques of the athlete will be required to achieve a full return to activity