Spine: Clinical Disorders

Study Notes

The ***Spine: Clinical Disorders*** document discusses common causes of spine pain in the pediatric to adult population. The document will assist you in understanding how the anatomy of the spine translates to these common disorders. You should become familiar with the common disorders of the spine as they relate to the specific **ANATOMICAL** structures. Focus on the important information, which has been **BOLDED.** The document will be helpful for the **Large Group Case Presentation and Small Group Case Discussions**.

INTRODUCTION

Back pain is quite common and can affect all ages. More than 30% of children experience back pain, while 90% of adults will experience back pain over the course of their lives. Fortunately, **most back pain, especially axial spine pain, will resolve over 6 weeks with minimal intervention**. Recognizing situations where back pain requires a more in-depth evaluation and specific treatment is imperative. **All patients presenting with back pain should have a thorough physical exam, including strength and sensory testing**. **Recurrent, chronic back pain, radicular (radiating) pain or pain associated with red flags (i.e., weakness, night pain, weight loss, morning stiffness) require further evaluation to look for underlying treatable disease**.

Work-up including x-rays, MRI, CT or bone scan should be utilized sparingly in acute back pain presentations to avoid unnecessary utilization and cost. **Treatment should focus on a combination of patient education, modified activity and therapeutic exercises.** Further treatment with medication, injections or surgery should be reserved for specific scenarios or complicated cases not responding to first line therapies. Care may be further complicated by life stressors (e.g., job satisfaction, family issues). **There is a high association between spine pain and psychosocial factors including the presence of major life events, depression, poor general health, and obesity.**

CAUSES OF SPINE PAIN

BACK PAIN IN CHILDREN

Unlike adults, most acute back pain in children (< 3 months duration) is likely be the result of an objective pathology. Thus, careful work-up is indicated. The **more common causes of acute back pain in children** include a **muscle strain**, ***spondylolysis (stress fracture)*, infection (discitis or osteomyelitis), or tumor**. **Disc herniation is rare in the pediatric population** though should be considered especially in an older adolescent presenting with radiating symptoms. **Scheuermann's kyphosis (juvenile kyphosis)** is a **condition that presents in early puberty, may be associated with upper back/thoracic spine pain** and is **characterized by a series of three consecutive wedged thoracic vertebrae**. The exact etiology is unclear. ***Scoliosis (see below)***, **abnormal curve in of the spine,** is common in the pediatric and adolescent population, though **is not typically a source of pain. The cause is often unknown(idiopathic), though can be secondary to an underlying congenital or neuromuscular disorder.**

Chronic/intermittent back pain in children is now recognized as increasingly common - up to 30% of children have chronic back pain without an identifiable cause. The **pain is most commonly activity related and may be accompanied by paraspinous spasm or hamstring contractures**. Treatment focuses on relieving symptoms using physical therapy and NSAID's (non-steroidal anti-inflammatory medications). It is important however to **remember that spondyloarthropathy or enthesitis related arthritis can present in childhood (*see document Spondylopathy of the Spine*)**. Thus, children with chronic back pain should have a careful history to assess for **inflammatory back pain symptoms**

(morning stiffness, relief with activity) and family history of arthritis, psoriasis or inflammatory bowel disease. Referral to a pediatric rheumatologist is indicated in patients failing to respond to usual first line interventions.

SPONDYLOLYSIS / SPONDYLOLISTHESIS

OVERVIEW - **Spondylolysis is a unilateral or bilateral defect (fracture or separation) in the vertebral pars interarticularis, usually in the lower lumbar vertebrae**. (Figure 1) In young athletes, spondylolysis usually represents a fatigue fracture in the posterior arch of the spine, specifically the **bony area of the pars interarticularis (pars) between the zygapophyseal (facet) joints.** It rarely occurs before age 5 years and is usually associated with sports in which hyperextension of the back is common, such as gymnastics, cheerleading, diving, weightlifting, and football. **Spondylolysis occurs at the fifth lumbar vertebra (L5) approximately 85 to 95 percent of the time, with an L4 locus in 5 to 15 percent of cases**.

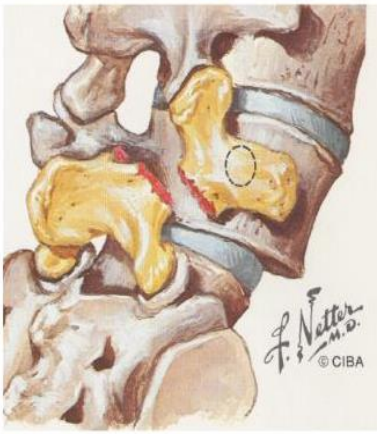


Figure 1 Oblique view of spine showing a pars interarticularis fracture

Spondylolisthesis is the slip of one vertebra relative to another because of pars interarticularis insufficiency. It is rarely painful unless progressive or already severe. Severe slip can cause central canal and/or foraminal narrowing and lead to neurologic symptoms.

PRESENTATION - In the symptomatic patient, the classic history will note a **child or adolescent** athlete playing a sport that requires **repetitive lumbar extension and rotation**. The onset of pain may be either acute or insidious over several weeks. Patients will **report their low back pain increases with strenuous activity or hyperextension and improves with relative rest**. Pain typically remains located in the low back with occasional radiation to the buttock and/or proximal lower extremities, while neurologic symptoms such as numbness/tingling in the lower extremities are uncommon.

Figure 2 Stork Test

Physical exam ought to include single-leg hyperextension, otherwise known as the **Stork test** (Figure 2). The patient should be instructed to stand on one leg while simultaneously hyperextending the low back. A **positive single-leg hyperextension test is elicited by the reproduction of pain during this maneuver, typically worse when standing on the leg ipsilateral to the side of the pars defect.** Additional physical exam findings include the **hyperlordotic lumbar curve and tight hamstrings.** A complete neurologic exam is necessary, though isolated pars defects typically present with no neurological findings. Patients who present with persistent pain exacerbated with hyperextension often need further work-up. **A plain anteroposterior and lateral radiograph of the lumbar spine is the first line study.** If negative and the patients have persistent pain after 4-6 weeks rest, then consider advanced imaging.

IMAGING - Imaging will include a variety of modalities as noted below:

- **XRAYS:** Initial **X-rays** (Figure 3A) should include **AP and lateral views** to **assess for a pars fracture and/or evidence of listhesis (slippage**). An oblique view of the lumbar spine may reveal the fracture as the collar of the "Scotty-dog," (Figure 3B). The radiation dose from such imaging is quite high, so most practitioners do not obtain these views anymore.
- **BONE-SPECT SCAN:** A **Bone-SPECT scan** (Figure 3C) can **identify a pars fracture and help characterize the fracture (incomplete vs complete, acute vs chronic**) but involves radiation.
- **MRI: MRI** (Figure 3D) can help **identify pars fractures and does not involve radiation** but may miss subtle stress fractures. They are helpful in assess for a disc herniation or disc infection.

- **CT SCAN: CT Scans** (Figure 3E) can **identify/characterize the fracture (incomplete vs complete, acute vs chronic) and determine if it is acute or chronic.**

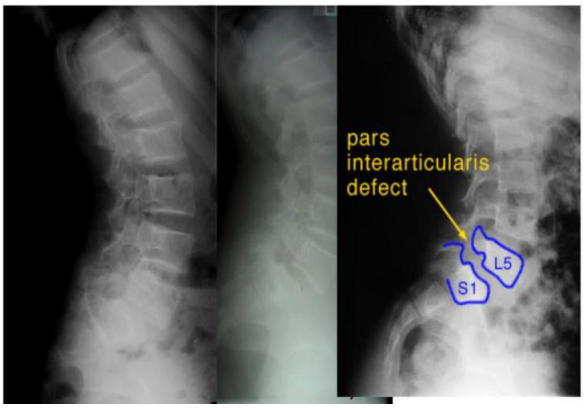


Figure 3A AP and Lateral X-rays of the Spine

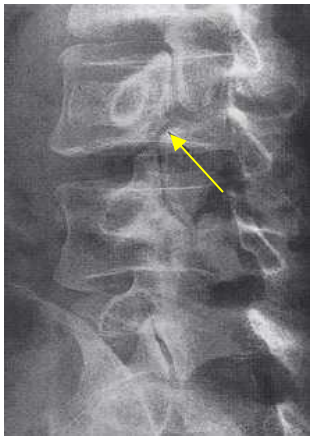


Figure 3B Oblique view showing pars fracture [yellow arrow]

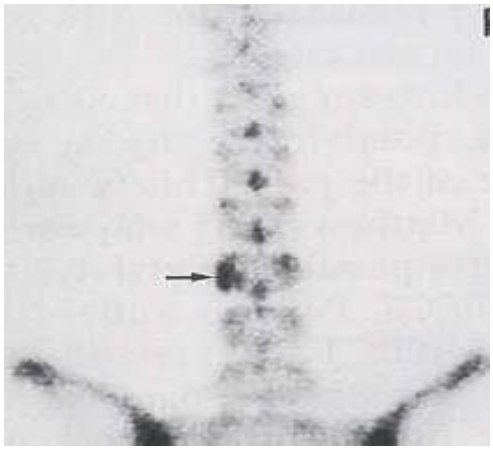


Figure 3C Bone SPECT Scan showing pars fracture [black arrow]

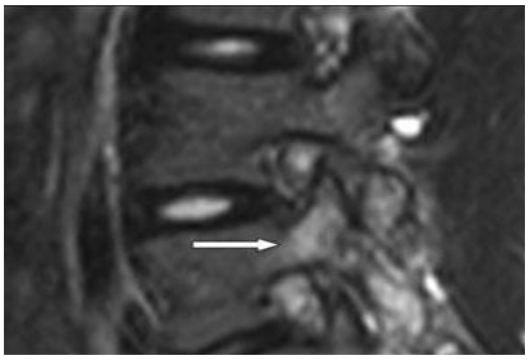


Figure 3D MRI Scan showing pars fracture [white arrow]

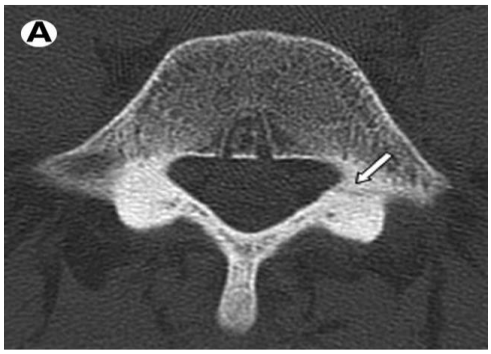


Figure 3E CT showing pars fracture [white arrow]

TREATMENT - A comprehensive **treatment plan of rest (potentially up to 3 months for acute fractures**), **physical therapy and a structured return to play protocol is essential to optimize healing**. Some practitioners may recommend a brace to support the spine during the healing process. Rarely, surgery may be needed for cases with chronic spine pain, neurologic compromise, or instability.

ADOLESCENT IDIOPATHIC SCOLIOSIS

OVERVIEW - **Adolescent idiopathic scoliosis (AIS),** is the most type of scoliosis and is defined as **spinal curvature without identifiable cause in patients aged 10-18 years old**. The incidence is 3% for curves of between 10 and 20 degrees and 0.3% for curves over 30 degrees. It occurs much **more frequently in females than males** (10:1). There is often a positive family history of scoliosis. In addition to idiopathic scoliosis**, other types include congenital, neuromuscular, and syndromic**. AIS typically involves a lateral curvature of the spine (> 10 degrees) with a rotational component as well. **A right thoracic curve is most common with an elevated right thoracic prominence on forward bending**. The latter prominence is due to the rotatory component. A left sided curve or a left side high prominence should prompt consideration of other conditions.

PRESENTATION - The **typical presentation of AIS** is most **often a painless prominence of the thoracic back**, noted either by the patient's parent or by a provider during a well child exam. Patients typically do not have any history of known trauma or injury. A thorough neurologic examination should be performed, especially if there is associated weakness or numbness in the extremities.

Adam's Forward Bending test (Figure 4): The **most common screening method.** Shoulder height assessment, truncal shift, pelvic tilt and waist asymmetry can also be noted to suggest scoliosis. If a notable thoracic rib prominence is appreciable, then measurement of the prominence with a Scoliometer.

Scoliometer (Figure 5): A **Scoliometer should be used to measure the angle of the thoracic prominence**. If the **Scoliometer measurement is greater than 7**° (typically correlating to a coronal curve of 20°), **then plain spine radiographs (ie x-rays) should be obtained to measure the true curvature.**

Figure 4 Adam's Forward Bending test

IMAGING - Standing full spine plain radiographs, PA and lateral views, are the initial imaging modality. (Figure 6) The **Cobb angle (Figure 7) is a measurement of the greatest angle within the vertebral column; measured from the superior endplate of the superior most vertebra of the curve to the inferior endplate of the most inferior vertebra in the curve**. The radiographs can also help establish the **Risser stage (Figure 8), a classification of skeletal maturity, based on the ossification and fusion of the ischial crest apophysis**. Both the skeletal maturity and degree of curvature determine treatment. (See below)

Figure 5 Scoliometer

TREATMENT - Treatment for AIS is primarily **dependent on the remaining growth predicted for the patient and the severity of the curvature**. These two factors help predict the likelihood of progression of the curve. Observation, bracing, and occasionally surgery are the mainstays of treatment. **Observation** with **serial radiographs until skeletal maturity is sufficient in the majority of cases with under 25 degrees of angulation**. **Bracing** can be an effective option for younger adolescents with **curves between 25° and 45**°. Bracing must be worn at least 12 hours each day to effectively stop progression, optimally 16-23 hours. Bracing will not correct the existing deformity. **Surgery is generally reserved for curves greater than 50°.** It is important to keep in mind that surgery for AIS is largely for cosmesis, as a significant impact on respiratory function is only noted once curves exceed 70°, with respiratory failure occurring if curves reach great than 110°, due to the restrictive impacts of the spinal curvature on the lungs.

Figure 6 AP x-ray of the spine showing a scoliosis

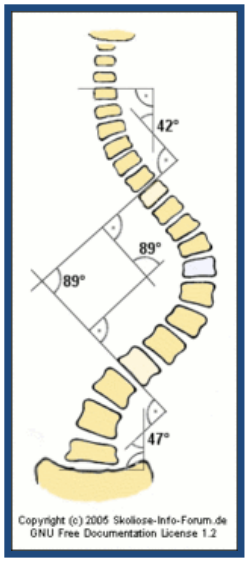


Figure 7 Cobb Angle

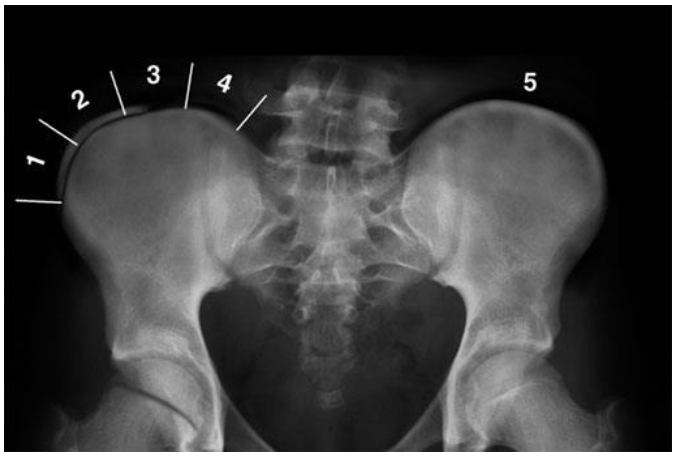


Figure 8 Risser Stages

BACK PAIN IN ADULTS

MUSCULAR SPINE PAIN

OVERVIEW -The **most common cause of neck and low back pain in children and adults is muscular** (stemming from muscle and/or associated fascia). Symptoms are **often caused by or associated with repetitive lifting and twisting, operating vibrating equipment, poor fitness, and overuse, including poor ergonomics**. In the **neck, "whiplash syndrome"** or neck pain without identifiable structural injury after a **motor vehicle collision** is a common occurrence. In the thoracic and lumbar spine, muscle strains will occur from normal activities of daily living or lifting injuries. Though the exact etiology of the pain is unclear, most patients have deconditioning of the muscles that is thought to lead to altered biomechanics and pain symptoms.

PRESENTATION - **Paraspinous strain and resulting muscle spasm are the most common causes of low back pain**. Symptoms are axial in nature without neurologic compromise. **Movement including flexion, extension and rotation may reproduce symptoms**. The work-up includes a careful history and physical exam, which reveals paraspinous muscle tenderness, no midline tenderness and a normal neurological exam.

IMAGING - In **general, x-rays are not indicated for this diagnosis. Especially if the onset of symptoms is recent (<6 weeks duration**), and there is no midline tenderness, no focal neurological deficit or red flags (i.e., night pain, weight loss).

TREATMENT - Treatment goals include **patient education, minimizing rest, and focused efforts towards returning to activity**. An "Act as Usual" approach has been shown to work better than many specific treatments. Strategies to minimize time away from work include daily walking, regular home exercise, an avoidance of narcotics and consideration of NSAIDS or muscle relaxants. In general, when "Act as Usual" does not bring a return to prior activity levels (**typically after 6 weeks), employ a "multidisciplinary approach**" early. Such an approach may include physical therapy sessions, massage therapy, acupuncture, job counseling, and life-skills assistance. For long-standing back pain interfering with return to work, work-hardening programs (programs designed to help patients deal with their discomfort and perform tasks required at their jobs) in combination with multidisciplinary therapy including "back-school", counseling, and pain management have been shown to be best to get people back to work.

CERVICAL AND LUMBAR DISC DISEASE

OVERVIEW - Degenerative disc disease is very common in adults. It occurs with aging and represents a loss of disc height due to a decrease in the water content of the disc. Though quite commonly seen with MRI imaging, a degenerative disc is not typically the source of one's back pain. **Herniated Discs** are more likely to be seen in adults than adolescents or children. **A herniated disc occurs when the relatively weak posterolateral region of the annulus fibrosis fails resulting in migration of the nucleus pulposus into the spinal canal**. When **nerve roots** are compressed, **radicular signs** may be present (i.e. abnormal motor or sensory function in the distribution of that nerve root). The most common levels for a disc herniation are C5-6 in the cervical spine and L4-L5 or L5-S1 in the lumbar spine.

PRESENTATION - Symptoms include **neck or lower back pain with radiation into the extremity.** Pain is typically **worsened with flexion movements as well as coughing or sneezing**. The **distribution of numbness, weakness and depressed reflexes will depend upon the level of the herniation (*see Spinal Cord and Spinal Nerve [page 6-8] and Upper Limb – Anatomy [pages 43-38*])**. **Spurling's maneuver** (Figure 9) or **Straight Leg Raise** (Figure 10) may reproduce the radicular symptoms in the cervical or lumbar spine, respectfully.

Figure 9 Spurling maneuve

Figure 10 Straight Leg Raise

IMAGING - MRI can help confirm a herniated disc at a specific level and rule out other causes of spine pain. (Figure 11 - MRI of the Lumbar Spine and Figure 12 – MRI of the Cervical Spine) MRI is indicated for anyone complaining of bladder or bowel incontinence or worsening neurologic findings.

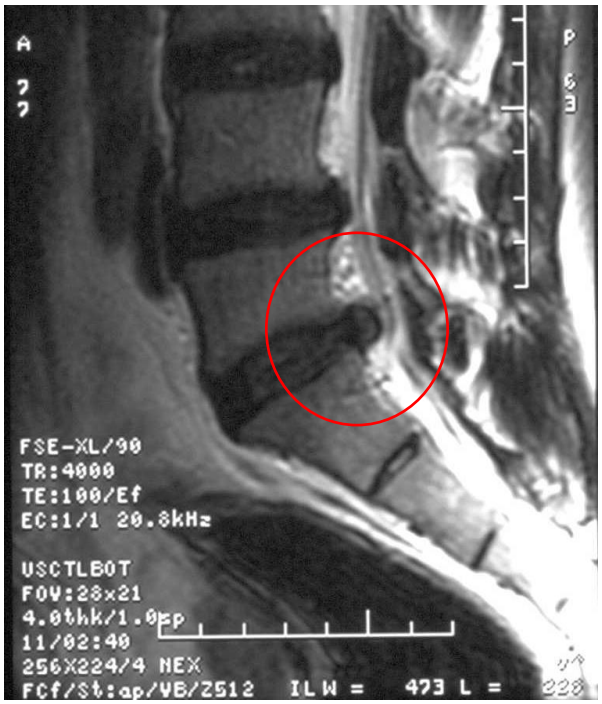


Figure 11MRI of the Lumbar Spine (T2 Sagittal View) showing a disc herniation at the L5-S1 level as noted by the red circle.

Figure 12 MRI of the Cervical Spine (T2 Sagittal View) showing a disc herniation at the C6-7 level as noted by the red circle.

TREATMENT - Initial treatment includes **activity modification, walking, medications (judicious use of NSAID's, corticosteroids and/or nerve stabilizers) and physical therapy**. More invasive interventions including **epidural spinal injections and surgery should be reserved for cases not responding the previously listed interventions or neurologic compromise**.

SPINAL STENOSIS

OVERVIEW- **Spinal Stenosis** (Figure 13) or **narrowing of the spinal canal**, may be due to **spondylolisthesis or acquired via osteophyte encroachment of osteoarthritis (spondylosis**). **Bony growth deformities (such as spurs and osteophytes**) may result in **stenosis of the spinal canal and pressure on spinal nerves**. **Common sites** of these bony growths include the **uncovertebral joints** (small joints found in the cervical spine between the uncinate or lateral superior process on one vertebra and the inferior process of its neighbor), **facet joints and intervertebral discs**. **Nerve root or spinal cord compression may result in neural injury**. In the cervical spine, stenosis typically occurs in the middle to lower segments and may present with symptoms of radiculopathy or spinal cord compression. In the lumbar spine, spinal stenosis is most commonly observed at the L4-5 level although it may occur at other levels as well.

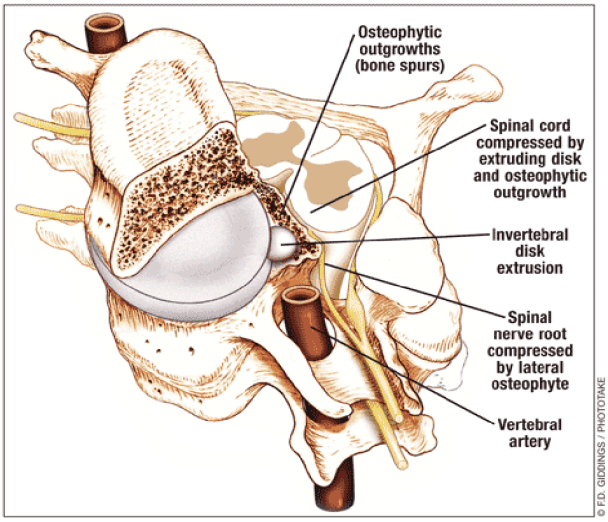


Figure 13 Anatomy showing narrowing of the spinal canal.

PRESENTATION - Patients will complain of lower back pain that **worsens with walking and improves with sitting or leaning forward. There may be radiation of the pain into the extremities**. **Physical exam** will reveal a **significant limitation of extension of the spine with or without neurologic changes in the extremities.**

IMAGING – **Xrays of the spine** (Figure 14) will reveal **significant bony changes related to dengenerative/osteoarthritis**. **MRI of the spine** (Figure 15) will assist in **visualizing bony and soft tissues structures**. (i.e. discs) while a **CT scan** of the spine (Figure 16) provides a clearer picture of the bones.

Figure 14 Lateral Xray showing degenerative changes at the L5-S1 level

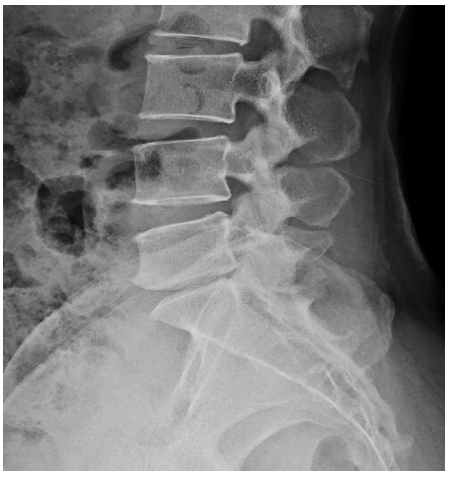


Figure 15 MRI of the Lumbar Spine noting

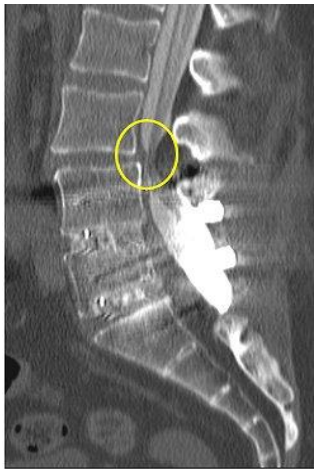
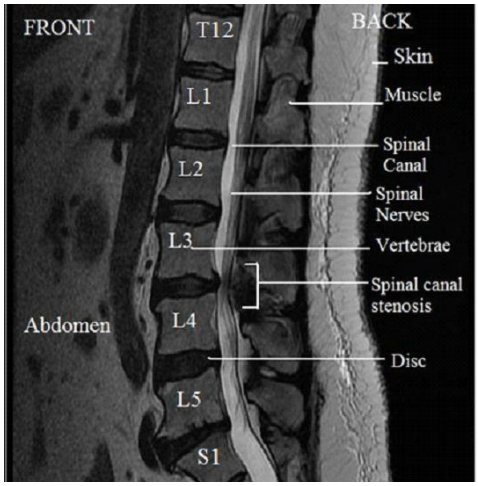


Figure 16 CT of the Lumbar Spine. Sagittal View showing Spinal Stenosis at the L3-4 level.



TREATMENT - Treatment should focus on **maximizing strength around the spine through exercise. Surgery may be warranted for those not responsive to conservative treatment or those with neurologic compromise.**

SPINE TRAUMA - FRACTURES

HIGH ENERGY FRACTURES

OVERVIEW - **High-energy spine trauma** (e.g., motor vehicle accident, sports collision) resulting in **fracture** is an obvious cause of neck and back pain. These patients typically have the appropriate history, **require immobilization and careful serial neurological exams** during work-up, and appropriate and timely imaging studies to optimize patient outcomes. However, some fractures are subtle and require additional detective work and attention to detail.

Figure 17 CT scan of the spine (axial view) illustrating significant fracture of the vertebral body

PRESENTATION – Patients will present with **significant midline pain involving the spine region that worsens with attempted movement.** Depending upon the severity of the trauma, they may experience neurologic changes (i.e., weakness, decreased sensation, loss of consciousness). Therefore, a thorough neurologic examination is crucial. Any **individual suspected of having a traumatic spine injury should undergo stabilization prior to obtaining radiographic images.**

IMAGING - Spine trauma images will include **x-rays, CT scans** (Figure 17) **or MRI, depending upon the concern**. Note, **children may have a *spinal cord injury without radiographic evidence of a fracture***, so immobilization with spine precautions until a complete workup is completed is mandatory for the child with a suspected spinal cord injury.

TREATMENT Further recommendations regarding non-operative vs operative management will **depend upon the location and extent of the fracture.**

LOW ENERGY FRACTURES

OVERVIEW - **Low energy spine fractures** are more common and are perhaps more easily missed than the high energy variety. Have a healthy dose of suspicion when confronted with an **elderly or post-menopausal patient** who might be susceptible to an **osteoporotic fracture**. The incidence of **vertebral compression fractures** increases with age among women over 50 yrs old. Studies suggest 8% to 13% of women in their 60s and 30-40% of women in their 70s experience a vertebral compression fracture. The **World Health Organization notes the following risk factors for fractures in postmenopausal women: low bone density, age, personal history of fracture, family history of fracture, smoking, heavy drinking, administration of steroids, and rheumatoid arthritis.**

Figure 18 Xray of the Thoracic Spine showing compression of the vertebrae

PRESENTATION – Patients with **vertebral compression fractures** will present with the **acute onset** of spine pain after minimal activity (e.g. bending forward, lifting an object). The pain will **localize the midline spine but could radiate if the fracture impacts a nerve**.

IMAGING -**Plain AP and lateral radiographs** (Figure 18) of the area of concern is the initial study of choice. **Imaging will show a compression of the vertebrae relative to the others**.

TREATMENT - Several approaches, including **exercise therapy, vitamin D administration, and environmental adjustment at home (e.g., removal of loose rugs, limited stairs for fall prevention)** have been reported to be effective.

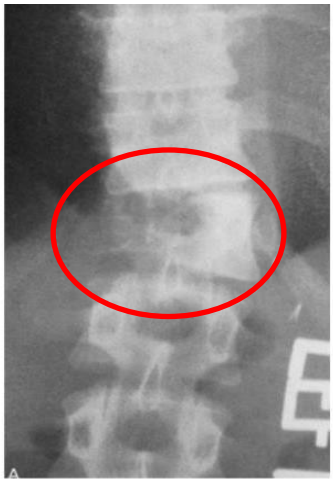


Figure 19 AP Thoracic Spine Xray showing tumor in bone (red circle)

UNCOMMON CAUSES OF SPINE PAIN

METASTATIC DISEASE

OVERVIEW- **Metastatic disease is MUCH more common than primary tumors of the spine**. Fifty percent of all patients with solid tumors will have spine metastases at some point. The **most common metastatic cancers to spine are breast, lung, prostate, and renal**. **Multiple myeloma and lymphoma of bone may also involve the spine**. Metastatic disease through hematogenous spread may present as an incidental finding in an asymptomatic patient, in patients with known primary tumors, as localized spinal pain, and by focal neurological findings in a patient with or without a known tumor.

PRESENTATION - Symptoms/signs may include **pain (nighttime interfering with sleep, out of proportion to a mild traumatic event, constant or worsening), upper or lower extremity radicular symptoms due to spinal cord or nerve root compression, and loss of normal bowel and bladder function that may be irreversible**. Pathologic fracture through a tumor site may lead to paraplegia

IMAGING - **X-rays** (Figure 19), **MRI or CT** will help to identify and characterize the lesions.

TREATMENT - Further recommendations regarding management will depend upon the etiology and location of the tumor.

INFECTION

OVERVIEW - **Infection of the vertebrae or disc** (Figure 20) is a well-recognized cause though uncommon cause of back pain. Infection of the vertebral body was commonly due to tuberculosis (Pott's disease) but is rare due to the decreased incidence of tuberculosis (TB). Spine infections, in particular **discitis or osteomyelitis**, are **uncommon in adults, but may be seen in children. Immune compromised patients** are at the greatest risk for infection of the spine.

Figure 20 Infection of the spine (xray [left] and MRI [right])

PRESENTATION - Patients presenting with an infection of the spine will report **pain in the spine region, often with motion or at nigh**t. In addition, they will note **systemic signs of infection (e.g., fever, chills, unexpected weight loss, decreased energy)**. These patients should undergo **further laboratory testing, including inflammatory makers.**

Top Tip: Young children with discitis are often unable to localize their pain and may present with abrupt refusal to walk. Careful exam may reveal pain with axial loading; discitis should be considered in the differential diagnosis of any child presenting with prolonged fever without a clear source.

IMAGING - **Radiographic** changes may take 2-3 weeks to appear, but bone scan is usually positive at the affected location. **MRI** will help identify the location and extent of infection. (Figure 20)

TREATMENT - ***Staph. aureus* is the most common organism involved in a childhood spinal infection.** Empiric antibiotics to cover Staph (with or without bracing) are the usual treatment. Biopsy is rarely indicated and is reserved for more indolent or complicated cases.

SPONDYLOARTHROPATHY OF THE SPINE

Arthritis of the spine is common. ***Spondylosis* is the term used to describe any degenerative condition of the spine**, including the spinal pathology due to osteoarthritis, rheumatoid arthritis (common in the cervical spine), and the ***seronegative spondyloarthropathies (a group of inflammatory joint diseases with a predilection for axial involvement)***.

The spondyloarthropathies is an umbrella term for a collection of overlapping **inflammatory disorders that tend to present with asymmetrical arthritis, involvement of the sacroiliac joints and spine, and *enthesitis* (inflammation of the sites where tendons attach to bone**). These disorders are immune mediated in nature but patients do not have positive rheumatoid factor in the serum (hence the term *seronegative*). Other common rheumatologic tests such as ANA and markers of systemic inflammation such as CRP and ESR are not reliable markers for screening or diagnosis of these disorders. Unlike most other forms of arthritis, the **spondyloarthropathies tend to have a strong genetic inheritance pattern. There is a high degree of association with the human leukocyte antigen HLA-B27**. The key presenting signs and symptoms for these disorders is back pain and stiffness, particularly in the morning and often relieved somewhat by movement. These classic symptoms of inflammatory back pain should warrant additional evaluation for a rheumatologic cause of symptoms.

Note: We will review these disorders in more detail in week 4 of this course when we examine chronic arthritis syndromes.

EXTRA-SPINAL CAUSES OF BACK PAIN

Potential causes of back pain not related to back pathology are common and must not be overlooked. These will vary depending upon the location but **would include cardiac ischemia, shoulder pathology, ovarian cyst, nephrolithiasis, pancreatitis, abdominal aortic aneurysm, gastric ulcer disease, and drug seeking behavior, among others**. (Figure 21)

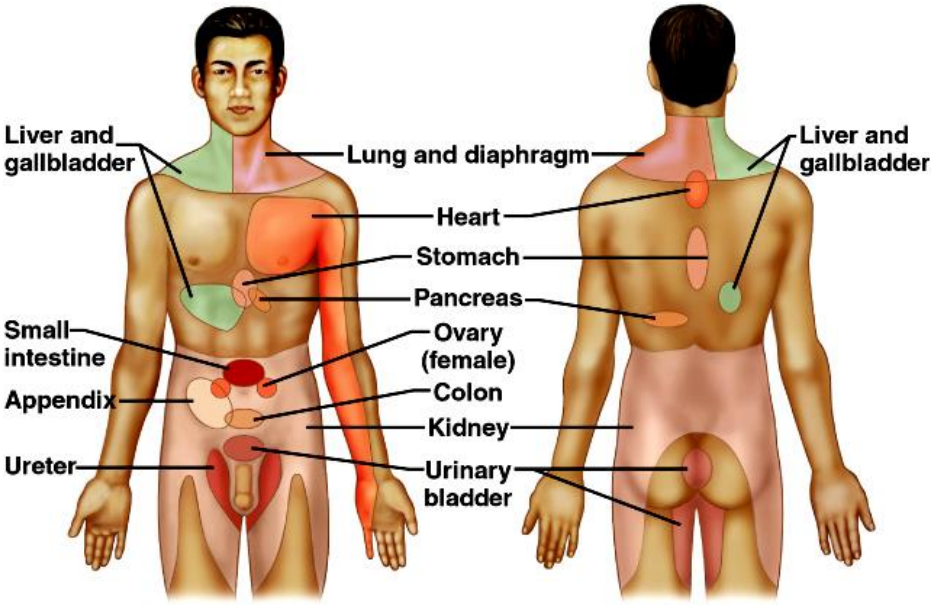


Figure 21 Common tumors of the spine.

Summary

Spine pain is quite common, and most patients will present to their primary care physician for further evaluation. The **etiology of spine pain includes musculoskeletal or non-musculoskeletal causes as noted in Figure 22 and Table 1.** Fortunately, most of the spine pain can be managed non-operatively utilizing a combination of continued movement, exercise, and judicious use of medications. Individuals with concerning symptoms (e.g., trauma, fever, chills, night pain or neurologic changes) will require further imaging to discern the etiology of the symptoms. Referral to a spine specialist is appropriate for patients who have not responded to conservative treatment.

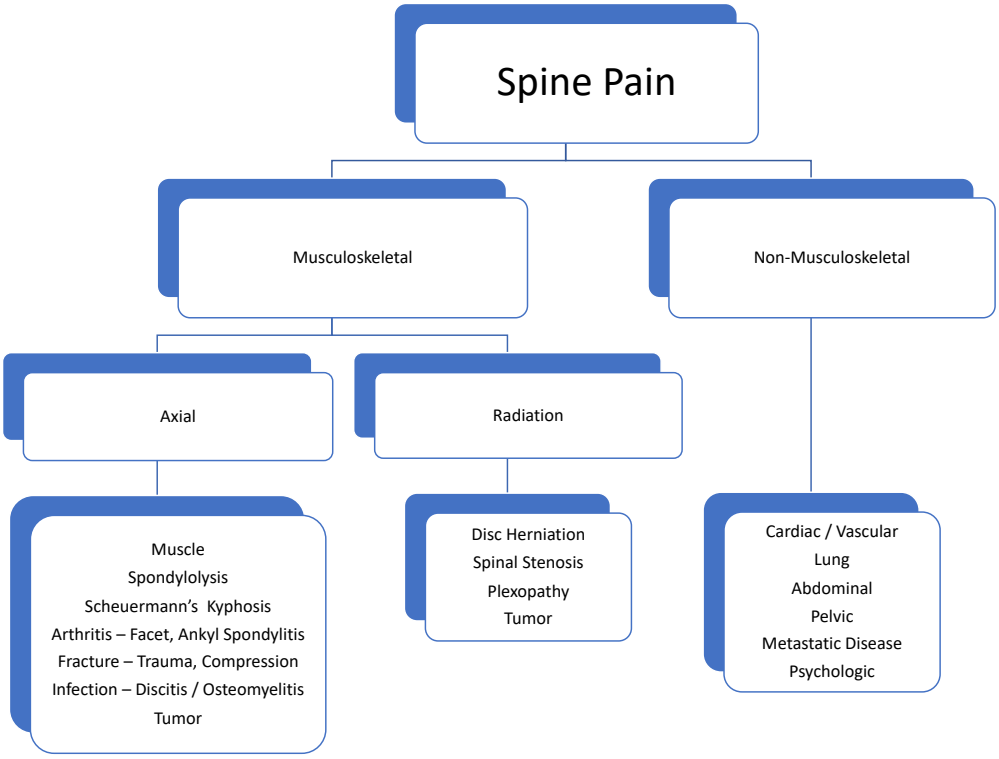


Figure 22 Common disorder of the spine

TABLE 1

DIAGNOSIS	AGE	SYMPTOMS	PHYSICAL EXAM	IMPORTANT STRUCTURES
Spondylolysis / Spondylolisthesis	Adolescent	Axial Spine Pain worse with extension	Pain worse with extension	Pars Interarticularis
Adolescent Idiopathic Scoliosis	Adolescent	Not associated with pain	Spinal curvature	Spine Vertebral Body
Scheuermann Kyphosis	Adolescent	Not associated with pain	Thoracic Kyphosis	Spine Vertebral Body
Muscle Strain	Adult	Axial spine pain, often secondary to activity	Paraspinal pain without radiation	Spine Muscles
Radiculopathy	Adult	Pain radiating into the arm or leg; Possible numbness and weakness	Numbness and/or weakness in a specific spinal level distribution	Spine Disc
Spinal Stenosis	Older Adult	Spine pain with occasional radiation into the legs; worse with ambulation	Numbness and/or weakness in a specific spinal level distribution	Spinal Foramen or Central Canal
Spinal Fracture	All Ages	Axial Spine Pain	Axial Spine Pain	Bony Spine Structures such as Vertebral Body
Metastatic Disease	All Ages	Axial Spine Pain, Systemic Complaints	Axial Spine Pain	All Spine Structures depending upon location of tumor
Spine Infection	All Ages	Axial Spine Pain, Systemic Complaints	Axial Spine Pain	Spine Disc, Vertebrae
Seronegative Spondyloarthropathies	Adolescent or Young Adult	AM Axial pain/stiffness, improves with activity and NSAIDS	Pain on ROM, Limited ROM, pain over SI joints, pain over entheses, dactylitis/psoriatic skin rash/nail pitting	Facet joints, SI joints, large joints, entheses